

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT				1. CONTRACT ID CODE		PAGE OF PAGES	
2. AMENDMENT/MODIFICATION NO.		3. EFFECTIVE DATE		4. REQUISITION/PURCHASE REQ. NO.		5. PROJECT NO. <i>(If applicable)</i>	
6. ISSUED BY		CODE		7. ADMINISTERED BY <i>(If other than Item 6)</i>		CODE	
8. NAME AND ADDRESS OF CONTRACTOR <i>(No., street, county, State and ZIP Code)</i>				(X)		9A. AMENDMENT OF SOLICITATION NO.	
						9B. DATED <i>(SEE ITEM 11)</i>	
						10A. MODIFICATION OF CONTRACT/ORDER NO.	
						10B. DATED <i>(SEE ITEM 11)</i>	
CODE		FACILITY CODE					

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers

☐ is extended, ☐ is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. **FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER.** If by virtue of this amendment your desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA *(If required)*

**13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS.
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.**

CHECK ONE	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: <i>(Specify authority)</i> THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES <i>(such as changes in paying office, appropriation date, etc.)</i> SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
	D. OTHER <i>(Specify type of modification and authority)</i>

E. IMPORTANT: Contractor ☐ is not, ☐ is required to sign this document and return _____ copy to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION *(Organized by UCF section headings, including solicitation/contract subject matter where feasible.)*

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER <i>(Type or print)</i>		16A. NAME AND TITLE OF CONTRACTING OFFICER <i>(Type or print)</i>	
15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA	16C. DATE SIGNED
<i>(Signature of person authorized to sign)</i>		<i>(Signature of Contracting Officer)</i>	

Item 14. Continued.

CHANGES TO VOLUME I – PROJECT INFORMATION, BIDDING REQUIREMENTS, CONTRACT FORMS, AND CONDITIONS OF THE CONTRACT

1. Replace the following Sections with the attached new Sections of the same number and title, bearing the notation "ACCOMPANYING AMENDMENT NO. 0005 TO SOLICITATION NO. DACA63-02-R-0011."

SECTION 00120 PROPOSAL SUBMISSION REQUIREMENTS
SECTION 00150 PROPOSAL EVALUATION AND CONTRACT AWARD

2. At the end of Section 00500 FORMS, Insert the attached Small Business Subcontracting Plan, pages 1 through 9.

CHANGES TO VOLUME II – DESIGN AND PERFORMANCE REQUIREMENTS

3. Replace the following chapters with the accompanying new chapters of the same number and title, bearing the notation "ACCOMPANYING AMENDMENT NO. 0005 TO SOLICITATION NO. DACA63-02-R-0011:"

CHAPTER 00840 REFERENCED DOCUMENTS
CHAPTER C2 INTERIOR FIXTURES
CHAPTER C21 IDENTIFYING DEVICES
CHAPTER C23 WINDOW TREATMENT
CHAPTER D3 HVAC - HEATING, VENTILATING, AND AIR CONDITIONING
CHAPTER D36 HVAC CONTROLS
CHAPTER D43 FIRE DETECTION AND ALARM
CHAPTER E19 OTHER EQUIPMENT

CHANGES TO VOLUME III – SPECIFICATIONS

4. New Sections.- Add the following accompanying new section bearing the notation "ACCOMPANYING AMENDMENT NO. 0005 TO SOLICITATION NO. DACA63-02-R-0011 and add the section number and title to the Project Table of Contents:"

SECTION 15995A COMMISSIONING OF HVAC SYSTEMS

5. Replacement Sections – Replace the following sections with the accompanying new sections of the same number and title, bearing the notation "ACCOMPANYING AMENDMENT NO. 0005 TO SOLICITATION NO. DACA63-02-R-0011:"

SECTION 01016 DESIGN DOCUMENT REQUIREMENTS
SECTION 01368 SPECIAL PROJECT PROCEDURES FOR FORT HOOD
SECTION 15487 VEHICLE MAINTENANCE EQUIPMENT

CHANGES TO VOLUME IV – ATTACHMENTS

6. Attachment H – "EC1110-1-92 Classification of Type of Construction" – Replace this sheet with the attached new sheet Attachment H – "EC1110-1-94 Classification of Type of Construction".

CHANGES TO THE DRAWINGS

7. Write-in change to the drawings.- Drawing A-5, Electrical note paragraph E, #5: change "DRAWOUT CIRCUIT BREAKERS" to "CIRCUIT BREAKER".

8. Replacement Drawings.- Replace the drawings listed below with the attached new drawings of the same number, bearing the notation "AM #0005":

a01.cal	A-1	Functional Requirements
a03.cal	A-3	Design Analysis
a04.cal	A-4	Performance Standard Criteria
a07.cal	A-7	Features Of Functional Areas
b01.cal	B-1	Floor Plan
b02.cal	B-2	Building Elevations
b03.cal	B-3	Building Elevations

END OF AMENDMENT

SECTION 00120
PROPOSAL SUBMISSION REQUIREMENTS
03/2002
AMENDMENT NO. 0005

1 GENERAL

1.1 INTRODUCTION

Through the use of a one-step procurement process, the Department of the Army desires to obtain the design and construction of a Tactical Equipment Shop at Fort Hood, Texas. In this procurement procedure consideration will be given to the Project Organization and Personnel; Experience; Past Performance; Financial Capacity; preliminary design, and cost proposals. Final selection and basis for award of the Design/Build Contract will be on the basis of qualifications, technical quality, price, and other salient factors considered to be in the Government's best interests. If awarded the Contract, the offeror shall complete the design and construction documents and construct the facility in compliance with those completed requirements.

1.2 WHERE AND WHEN TO SUBMIT PROPOSAL

Submit the Proposal no later than the date and time indicated in Item 13.A of the Solicitation, Offer and Award form (Standard Form 1442) found in Section 00010, SOLICITATION, OFFER, AND AWARD.

1.3 EXPLANATION TO PROSPECTIVE OFFERORS

Any prospective offeror desiring an explanation or interpretation of the solicitation, drawing, specifications, etc. must request such in writing, and are directed to the individuals listed in Section 00100 INSTRUCTIONS TO OFFERORS, soon enough to allow a reply to reach all prospective offerors before the submission of their proposals. Oral explanation/instructions given before award of a contract will not be binding. Any information given a prospective offeror concerning a solicitation will be furnished promptly to all other prospective offerors as an amendment to the solicitation, if that information is necessary for submitting proposals, or if the lack of it would be prejudicial to other prospective offerors.

1.4 REQUIRED TECHNICAL DATA FOR PROPOSAL SUBMISSION

Offerors are advised that the required data will be utilized for review and evaluation and used for determination of a "Quality Rating" by a Technical Evaluation Board and that all data submitted for consideration under this proposal will be reviewed only for the purposes required for evaluation and award. The Government will not make assumptions concerning the offeror's intent, capabilities, facilities, or experiences. Clear identification is the sole responsibility of the offeror.

1.5 PROPOSAL PREPARATION

Instructions for the preparation and organization of each proposal are included herein. The proposal shall be submitted as summarized below and as required by the specifications.

1.5.1 Volume I – Primary Design Construction Team Management Proposal

- A. Project Organization and Personnel**
- B. Experience**
- C. Past Performance**
- D. _____ (AM#5)**

1.5.2 Volume II – Preliminary Design Proposal

- A. Design Proposal (Volume II)**
- B. Preliminary Project Schedule (Volume II)**

1.5.3 Volume III – Cost/Price Proposal

- A. Solicitation, Offer and Award (SF 1442)**
- B. Price Proposal Schedule**
- C. Bid Guarantee**
- D. Representations and Certifications**
- E. Subcontracting Plan (Applies to Large Businesses Only)**
- F. Small Disadvantaged Business (SDB) Utilization Plan (Applies to all Offerors)**

1.5.4 Format

1.5.4.1 Written Material

- a. All written material, including catalog cuts, shall be submitted in standard three ring loose-leaf binders. Proposals shall be tabbed and labeled in a manner to afford easy identification from a Table of Contents. Font size shall be not less than 10 point. Each page shall be identified with the appropriate page number centered at the bottom of the page. Sheet size of the proposal contents shall be 8 ½ by 11 inches. 11 by 17 inch sheets will be allowed for charts and tables but will be counted as 2 single-sided or 4 double-sided pages. Legibility, clarity, coherence, and the contents are important. Volume I (The Primary Design Construction Team Management Proposal) proposal length shall be limited to 70 single-sided or 35 double-sided pages, exclusive of the cover sheet, Table of Contents, and appendices. The offeror shall not submit verbatim sections or attachments of this solicitation as part of their proposal. Offers that do not meet these requirements may be subject to rejection.
- b. A cover sheet identifying the offeror and the project shall be provided. The second sheet shall be a Table of Contents.
- c. Table of Contents. The proposal shall contain a detailed Table of Contents. The complete Table of Contents shall be included in each binder used.
- d. Materials submitted but not required by this solicitation (such as company brochures and equipment lists) shall be relegated to appendices.
- e. Proposal revisions for written portions of the proposal, including catalog cuts and specifications, shall be submitted as page replacements with revised text readily identifiable, e.g. bold face print or underlined. The source of the revision, e.g. Error, Omission, or Clarification (EOC), amendment or other Contractor-initiated change, shall also be indicated for each revision. Revised pages shall be numbered, dated, submitted in same number of copies as the original proposal submittal, and a different color page than the original.

1.5.4.2 Drawings

- a. Full size drawings shall be submitted in accordance with Section 1016, DESIGN DOCUMENT REQUIREMENTS. Each drawing shall be identified with the appropriate Sequence and Sheet Numbers in the lower right hand corner. The original and one copy of all drawings must be full size drawings. The remaining copies may be full size or reduced size, but no smaller than 11 x 17 inches.
- b. All alternate designs which may or may not be priced as additive or deductive items shall be graphically described on separate drawings from the base proposal design. All alternate designs shall meet the minimum requirements of the solicitation.

c. Proposal revisions for drawings shall be submitted as sheet replacements with all changes identified on the drawings with clouds and in the title block, including the source of the revision, e.g. Error, Omission, or Clarification (EOC), amendment, or other Contractor-initiated change. Revised drawings shall be numbered, dated, and submitted in the same number of copies as the original proposal submittal.

1.5.4.3 Electronic Material

(AM#5) The successful offeror shall submit one copy of the proposal and all revisions, if applicable, on CD-ROM disk within 5 calendar days of the notice of contract award. Revisions shall be incorporated in the documents, marked and tabbed according to the final proposal revision. All textual material, catalog cuts, and other non-drawing material shall be in Adobe Acrobat Portable Document Format (.pdf), arranged in the same order as the hard copy version with each section or part book marked. All drawings shall be formatted in accordance with Section 01016 DESIGN DOCUMENT REQUIREMENTS, Paragraph “.CAL Files.” The offeror must ensure that all textual material, if it has been scanned, has been converted to a text searchable document by using the Paper Capture tool in Adobe Acrobat.

1.5.4.4 Proposal Submission

(AM#5) The proposal submitted shall include an original and copies (hard copy) as indicated below. Each proposal shall be marked to clearly identify the original and the copies. The copies shall be numbered.

Volume I – Primary Design Construction Team Management Proposal	Original and nine (9) copies
Volume II – Preliminary Design Proposal	Original and nine (9) copies
Volume III – Cost/Price Proposal	Original and <u>one (1) copy</u> (AM#5)

1.6 REFERENCED PUBLICATIONS

Corps of Engineers' (COE) design criteria and manuals that are referenced in this solicitation, such as Technical Manuals (TM) and Instructions (TI), Military Handbooks, Engineering Regulations (ER), and Engineering Manuals (EM), can be downloaded from the Internet at the following address: <http://www.hnd.usace.army.mil/techinfo> or obtained from the current National Institute of Building Science's (NIB) Construction Criteria Base (CCB) CD-ROM disk. The COE SWD-AEIM, _____ (AM#5), and EC 1110-1-94 (AM#5) are on the Solicitation CD-ROM Disk. The Installation Information Infrastructure Architecture (I3A) guidelines can be downloaded from the Internet at the following address: <http://arch-odisc4.army.mil/>. Obtaining other referenced publications such as Federal and Military specifications, Military Standards, and industry standards (i.e., ASTM, ANSI, ACI, NFPA, building codes) will be the responsibility of each offeror. See Section 00100 INSTRUCTIONS TO OFFERORS, paragraph "52.211-2 AVAILABILITY OF SPECIFICATIONS LISTED IN THE DOD INDEX OF SPECIFICATIONS AND STANDARDS (DODISS) AND DESCRIPTIONS LISTED IN THE ACQUISITION MANAGEMENT SYSTEMS AND DATA REQUIREMENTS CONTROL LIST, DOD 5010.12-L (AUG 1998)", for information on obtaining these publications. Offerors are warned that due to the limited time for proposal preparation and submittal, there may not be enough time for ordering and receiving any of the above references. Failure to receive requested references will not be sufficient reason for extension of the proposal submission date.

1.7 UNNECESSARILY ELABORATE PROPOSALS OR QUOTATIONS

Unnecessarily elaborate brochures or other presentations beyond those sufficient to present a complete and effective response to this solicitation are not desired and may be construed as an indication of the offeror's lack of cost consciousness. Elaborate artwork, expensive paper and bindings, and expensive visual and other presentation aids are neither necessary nor wanted.

1.8 REQUIREMENT FOR SPECIAL MARKING OF PROPOSAL DATA

Envelopes or other cover for material submitted in response to this RFP shall be opaque, and must be so presented that they may easily be identified. At a minimum, the outside cover for each volume must show:

Destination of Proposal
Name and location of project as described in the RFP documents
Solicitation number
Name and address of offeror
Project volume number

Submit the proposal in the format specified. Oral or telephonic proposals or modifications will not be considered.

Mail or deliver the proposal to the address listed on the Standard Form 1442, "Solicitation, Offer and Award."

1.9 DESCRIPTION OF EVALUATION CRITERIA

1.9.1 Volume I – Primary Design Construction Team Management Proposal Preparation

The Primary Design Construction Team Management Proposal shall include information as described below and shall be presented in the sequence listed.

A. Project Organization and Personnel:

1. Personnel (Primary Design Construction Team):

- a. This factor considers the offeror's proposed design, construction, and management team. Provide professional resume data on the individuals who will be key personnel on the Primary Design Construction project team. Key personnel identified in this section should be senior working-level people who will be involved in design and construction on a day-to-day basis, as opposed to departmental level supervisors or executives. If reassignment of personnel is considered possible, provide the names and resumes of the alternate professionals in each assignment.

See Sections 01015 DESIGN REQUIREMENTS AFTER AWARD, 01320 PROJECT SCHEDULE, 01430 DESIGN QUALITY CONTROL, and 01451 CONTRACTOR QUALITY CONTROL for minimum personnel qualifications. The following list shall be provided as a minimum:

Project Manager
Project Architect
Senior Structural Engineer
Senior Mechanical Engineer
Senior Electrical Engineer
Senior Civil Engineer
Fire Protection Engineer
Corrosion Engineer or Specialist (NACE)
Lightning Protection Specialist (Am#3)
Registered Communication Distribution Designer
Design Quality Control Manager
Construction Quality Control Manager
Project Scheduler

Information to be provided includes:

Name
Project assignment
Name of firm with which associated

Years experience: with this firm, with other firms
Education: degrees(s)/year/specialization
Active registration: state and year first registered
Experience and qualifications relevant to proposed project: for each project listed, provide project description, project dates, the individual's project assignment to include specific roles and responsibilities, and its relevance to this solicitation. Identify the length of time key personnel stayed on their contracts and how well they managed their portion of the referenced contracts.

b. Identify the Designer(s)-of-Record for each discipline

c. In an appendix, provide letters of commitment for all key personnel on the Primary Design Construction project team and any proposed alternate personnel. By identifying these personnel, the offeror is making a commitment that, barring unforeseen circumstances, they are the personnel who will be assigned to the project. A letter of commitment from each firm committing specific individuals from the firm may be provided in lieu of separate letters for each individual. After contract award, substitutions for any of the key personnel or alternates shall require the Contracting Officer's approval.

d. Capacity to Perform

(1) (AM#5) Provide a list and number of key professional job titles within the offeror's and consultants' firms who are available and will be used as backup to each member of the Primary Design Construction Team when required.

(2) Discuss capacity to successfully perform the requirements of this Contract based on current workload and staffing. Discuss strategy to provide supplemental and/or replacement personnel to support this project during design and/or construction, as necessary. In the appendix, provide a list of all current contracts for the Primary Design Construction Team members, including consultants.

2. Team Organization and Management:

a. Provide an organizational chart and supporting narrative describing how the team will be structured. Include all key design and construction personnel and firms on the organizational chart. Discuss the specific roles and responsibilities of each key individual and firm.

b. Describe the proposed management structure for the team. Discuss how the design and construction process will be managed, to include a discussion on delegation of authority within the team.

c. Describe interactions within the team and with the Corps of Engineers during design. Discuss how design changes will be handled and the roles that various team members will play when dealing with design changes. Discuss the role of construction team members during design phase.

d. Describe interactions within the team and with the Corps of Engineers during construction. Discuss how changes will be handled during construction and the roles that various team members will play when dealing with changes during construction. Discuss the role of design team members during construction. Specifically address design team's role in construction Quality Control program; Requests For Information (RFI's); shop drawing/submittal review and approval; attending progress meetings; site visits; inspections; and contract completion and closeout.

e. Describe the time control systems to be utilized. Discuss the use of the project schedule for managing the design and construction. Describe internal procedures for handling delays to minimize time growth.

f. Identify the items of work to be self-performed by offeror and the percentage of the overall contract value that this work represents.

g. Describe the team's computer-aided drafting and design (CADD) capabilities. Identify the CADD software to be used in the design of this project; if all disciplines are not using the same CADD software, identify the software that each discipline is using. Discuss compatibility with the Government's target CADD. Explain how compatibility will be achieved if the design, or portion of the design, is prepared using a CADD system other than the Government's target CADD system. (Refer to Section 01016 DESIGN DOCUMENT REQUIREMENTS for information on the Government's target CADD system and compatibility requirements.)

B. Experience

1. Provide a list of projects currently underway or completed within the last 5 years that best demonstrates the design and construction experience of the team (firms and/or individual team members) to successfully complete this facility using a design/build process. Experience beyond 5 years ago for construction contractors will not be given consideration unless the key personnel proposed for this project played a significant role in the earlier project and the project can be shown to be similar to this project. An offeror must make clear the extent of involvement in those projects by current key personnel and clearly describe how the older project is similar to this project, considering changes in technology, materials, equipment, codes, etc. Experience beyond 5 years ago for design firms will not be given consideration.

List no more than 10 projects total. The list of projects shall include the following information:

- a. Project name and location
- b. Type of facility
- c. Nature of firm's responsibility (design, construction or both)
- d. Identify type of contract (design, design/build, or construction)
- e. Project owner's name and address and project manager's (point of contact) name, telephone number, fax number, and email address (if known)
- f. If a government contract, include the contracting agency and contracting officer's name, telephone number, fax number, and email address (if known)
- g. Date started
- h. Original scheduled completion date
- i. Actual completion date
- j. Overall size of facility (in square feet or square meters)
- k. Construction cost (excluding design costs)
- l. Duration of construction (excluding design time)
- m. Problems encountered and corrective actions taken
- n. Identify which proposed team members and/or firms were involved in the project; their specific roles and responsibilities on the project; and the extent of time they were involved with the project
- o. Relevance of experience to the solicitation project
- p. Was sustainable design used? If yes, indicate the certification level. (AM#5)**

2. Joint Ventures: If offeror represents the combining of two or more companies for the purpose of this RFP, the proposal shall indicate whether the firms have experience working together in design/build ventures and for how long and how many projects. In addition, each company of this joint venture shall list their Government contract experiences.

C. Past Performance:

1. For each design and/or construction firm on the project team, provide firm's name, address, and DUNS number.

2. Non-Corps References

For each non-Corps project listed under "Volume I: Experience" factor, offerors should send Client Authorization Letters and Contractor Performance Report (See Section 00500) to each reference listed in the proposal to assist in the timely processing of the past performance evaluation. In an appendix, provide a copy of issued letters with the offeror's proposal. Copies of aforementioned letters will not count towards the page limitation stated in Paragraph 1.5.4.1 of this Section.

3. Offerors are encouraged to submit awards, letters, evaluations, or other forms of recognition that demonstrate their performance capabilities and customer satisfaction. If provided, this additional past performance information shall be relegated to an appendix and will not count towards the aforementioned page limitation.

4. New Companies

For new companies entering the marketplace (without relevant company experience) the quality of the past performance of their key management personnel of the Primary Design Construction Team and consultants will indicate the risk of good performance and become the basis of the past performance evaluation. Identifying how long key personnel stayed on their contracts and how well they managed their portion of the referenced contracts will be of great importance in the evaluation process.

D. (AM#5) _____

1.9.2 Volume II – Design Proposal Preparation

PRELIMINARY DESIGN PROPOSAL

The purpose of the Preliminary Design Proposal is:

To provide sufficient design information for the Government to determine the acceptability of the proposed design in meeting the functional requirements set forth herein for operational use and economical maintenance during the anticipated life of the facility.

To provide data for a determination of the engineering sufficiency and soundness of the basic approach to the design for each technical discipline. Also, it will serve as a documentary check that the designer has been provided or has developed the essential engineering criteria necessary for all facets of final computations and detailed development of a thoroughly engineered, coordinated, economical, and functional design.

The Preliminary Design Proposal consists of two parts, the Design Proposal and the Preliminary Project Schedule:

A. Design Proposal

1. The design proposal shall include, as a minimum, the following descriptive narratives, manufacturer's catalog data, and graphic information:

a. Narratives

(1) General Description

(a) Provide brief description of the facility addressing the overall design, materials components, and engineering. **DO NOT INCLUDE DESIGN CALCULATIONS.** Include the following:

- (i) Basic site layout **for the Tactical Equipment Shop site and the option #2 Truck Loading Dock site (am#3)** and the rationale behind the site design. Address existing site features, site demolition requirements, new utilities, site improvements, **and identify pavement section to be used for hardstand pavement. (am#1)**
 - (ii) Building's architectural configuration and the rationale behind the design. Address relationship of the site and site activities to the building. Address exterior and interior building materials.
 - (iii) Building's interior configuration, to include general discussion on interior finishes, including those in the shops, offices, general administrative areas, warehouse and common areas (copy rooms, break/vending areas, restrooms). Discuss use of common areas within the facility. **DO NOT PROVIDE COLOR BOARDS.**
 - (iv) Structural system and the rationale behind the selection of the proposed system, including identification of major structural materials and systems.
 - (v) Heating, Ventilation and Air Conditioning system and rationale behind the selection of the proposed system.
 - (vi) Vehicle Maintenance Systems including waste oil, waste antifreeze, off-spec fuel collection and storage, POL distribution and dispensing systems, vehicle exhaust systems, parts wash and wash bay systems, compressed air systems and rationale behind the selection of the proposed systems.
 - (vii) Hoisting systems and the rationale behind the selection of the proposed systems.
 - (viii) Fire protection system and the rationale behind the selection of the proposed system.
 - (ix) Exterior power distribution systems (upgrade to existing system) and the rationale behind the selection of the proposed system. Discuss service to the building and location. Identify type of wire. Identify whether aerial or underground.
 - (x) Interior power distribution systems and the rationale behind the selection of the proposed system. Identify electrical characteristics of power supply (phase, voltage, KVA). Provide description of panels, protection devices and typical loading of circuits. Identify type of wire.
 - (xi) Exterior lighting system and the rationale behind the proposed system. Address exterior lighting locations, illumination levels for each area, and lighting controls.
 - (xii) Interior lighting system and the rationale behind the selection of the proposed system. Address illumination levels for each area, emergency lighting, and lighting controls.
 - (xiii) Interior communications systems (telephone, data, cable TV, sound transmission) and the rationale behind the selection of each system.
 - (xiv) Environmental Considerations and Occupational Safety and Health Issues.
- (b) Describe the energy-efficient and/or energy-saving features proposed for this project.
- (c) Identification of proposed methods of meeting security requirements.
- (d) **If the design proposal includes any deviations from the RFP requirements, including functional or adjacency requirements, identify the deviation, provide justification for the deviation, and describe the benefit/improvement that the deviation provides to the facility.** (See Section 00150 PROPOSAL EVALUATION AND CONTRACT AWARD, paragraph "DESIGN FREEDOM".)
- (e) **Identify all proposed betterments.** (See Section 00800 SPECIAL CONTRACT PROCEDURES, clauses entitled "DESIGN-BUILD CONTRACT ORDER OF PRECEDENCE" AND "PROPOSED BETTERMENTS".)

b. Manufacturer Catalog Data

Manufacturer catalog data shall include industry standard quality indicators for the specific material or equipment and that will be used to establish the proposed construction quality during proposal evaluation. Data may be in the form of CSI standard product information formats Manu-Spec and Spec-Data, and manufacturer's specifications and details. Furnish data, arranged by CSI Divisions, on:

- (1) Glazing: windows and glazing for library and classrooms.
- (2) Doors
- (3) Interior finishes, to include floors, base, walls, ceilings, toilet partitions, lavatory tops
- (4) Exterior finishes, to include walls, roof, and soffits
- (5) Interior and exterior light fixtures, including identification of where each proposed fixture type will be used
- (6) Any other catalog data deemed pertinent

c. Graphic Information

Furnish preliminary drawings and schematics to illustrate the proposal. If a plan does not fit on one standard size drawing sheet at the scale specified, provide an overall plan to fit on one standard size drawing sheet plus individual sheets at the scale specified.

- (1) Site Layout Plan, minimum scale 1:400 or 1:500, showing:
 - (a) Building location
 - (b) Service drives, parking, and hardstand
 - (c) Location of site features (i.e. landscaping, sidewalks, lighting, mechanical and electrical equipment)
 - (d) Set-backs
 - (e) Preliminary grading and drainage Plan
- (2) Architectural Floor Plans, minimum scale 1:100 (1/8" = 1'), with all areas identified, showing:
 - (a) Gross area of building; exterior and interior dimensions; size of areas; critical and basic dimensions.
 - (b) Area calculations
 - (c) Preliminary finish schedule
 - (d) Plumbing fixture locations, including drinking fountains
 - (e) Furniture layout (Note: Providing furniture is not a part of the Contract)
- (3) Interior Sections/Elevations, minimum scale 1:50 (1/4" = 1'), showing:
 - (a) Offices
 - (b) Common areas (break/vending areas, copy areas)
 - (c) Restrooms
 - (d) Shops
 - (e) Warehouse
- (4) Exterior Elevations of building(s), minimum scale 1:100 (1/8" = 1'), showing:
 - (a) Fenestrations and material indications.
 - (b) Critical and basic dimensions.
 - (c) Exterior finish materials.

(5) Building Cross-Sections

Provide one cross-section through each wing of the building(s) and one longitudinal cross-section through the building indicating floor and ceiling heights, and all overhead equipment and utility distribution as well as crane hook range of motion.

d. Sustainable Design. Using the Sustainable Project Rating Tool (SPiRiT), provide a self-assessment of the sustainability features of the facility (see Volume IV ATTACHMENTS for the Sustainable Project Rating Tool manual and rating sheets). For each required element and for each point-scored element where you have met (or exceeded) the requirement, provide justification of how you have met the stated requirement. Justification shall be documented on the non-annotated version of SPiRiT tool (SPiRiT v1.4 (.doc), April 2001) available on the Internet at <http://www.cecer.army.mil/Sustdesign/SPiRiT.cfm>, or use the version that is on the Solicitation CD. Justification shall be inserted in the document immediately after the requirement text for each element. Label the justification as "Justification of Scoring". Scoring shall be summarized on the SPiRiT scoring sheet (SPiRiT v1.4 (.xls), April 2001) available at <http://www.cecer.army.mil/Sustdesign/SPiRiT.cfm> (this file is also located on the Solicitation CD). This scoring summary shall be attached to the front of the SPiRiT tool in the submitted documentation. Goal is minimum Bronze level certification. If Bronze level certification cannot be attained, discuss the factors that prevent achieving this goal in one section prior to the beginning of the SPiRiT scoring summary.

B. Preliminary Project Schedule.

A time-scaled logic diagram shall be submitted with the Preliminary Design proposal reflecting the detailed design phase activities and summary level construction activities from Notice to Proceed through final completion, including all option work. Project Schedule shall conform to Section 01320 PROJECT SCHEDULE and may be used for preparation of the Preliminary Schedule required in Section 01320 after award. The following information shall be included as a minimum:

1. Detailed design activities
2. Summary level construction activities
3. Phasing requirements
4. Critical Path
5. Milestones and Constraints
6. Overall Design Duration, in calendar days
7. Overall Construction Duration, in calendar days
8. Overall Proposed Duration, in calendar days

The Contractor shall propose the contract durations for Work Item #1, Design and Construction of the new facility. The proposed duration shall not exceed the duration specified in Section 01000, Design and Construction Schedule. The proposed schedule shall support the proposed duration. Upon contract award, the successful offeror's proposed duration shall become the contract duration for Work Item #1. It should be noted that the Government will include provisions in the contract for liquidated damages for each calendar day the Contractor exceeds the contract schedule.

1.9.3 VOLUME III Cost/Price Proposal Preparation

Prices shall be firm. The offeror's price, to be considered in the competitive negotiation evaluation, shall be the offeror's Total Base Bid, including all option work, as shown on the price proposal schedule. The cost/price proposal will be evaluated separately, after evaluation of Volume I and Volume II. The cost/price proposal shall consist of the following:

1. Solicitation, Offer and Award.

The Standard Form 1442 shall be completely filled out and signed by a principal of the firm authorized to bind the design-build team. Signature(s) must be in long hand.

2. Price Proposal Schedule

- a. Offerors shall complete the Price Proposal Schedule by filling out the pricing data blanks.

b. Overhead and profit shall be applied proportionally to each category and will not be required to be shown separately.

c. Offerors shall include allowance for weather days in the Cost/Price Proposal and shall schedule any contingency for severe weather in accordance with weather requirements included in Section 01000, DESIGN AND CONSTRUCTION SCHEDULE.

3. Bid Guarantee.

The bid guarantee shall be submitted in accordance with Section 00700, Contract Clauses.

4. Representations and Certifications.

Representations are local, state, and federal representative statements and certifications made by the Offeror concerning a variety of issues. Complete each item in Section 00600, REPRESENTATIONS AND CERTIFICATIONS, and submit one original with the Volume III proposal.

5. Subcontracting Plan. (Applies to Large Businesses only.)

All large businesses shall submit a subcontracting plan with their technical and price/cost proposals. The plan shall be prepared in accordance with FAR 52.219-9. Failure to submit an acceptable subcontracting plan may make the offeror ineligible for award of the contract. The submission of the subcontracting plan is in no way advantageous to large businesses over any small business in the evaluation process. A sample subcontracting plan and scoring checklist are included on the solicitation CD-ROM disk. See Section 00100 INSTRUCTIONS TO OFFERORS, paragraph SMALL BUSINESS SUBCONTRACTING PLAN for additional information and Fort Worth District subcontracting floors.

6. Small Disadvantaged Business (SDB) Utilization Plan. (Applies to all Offerors.)

Offerors shall submit a SDB Utilization Plan, to include the following information:

- a. Identification of each SDB concern proposed and the work each is to perform.
- b. Targets expressed in dollars and percentages representing each SDB concern's participation of the total contract value.
- c. Total target value of all SDB participation, expressed in dollars and percentages, of the total contract value.

The offeror is put on notice that any targets represented in submitted proposal will be incorporated into and become part of any resulting contract. All proposed SDB concerns must be certified by the Small Business Administration and listed in the online database PRO-Net. SDB concerns may register in PRO-Net at <http://pronet.sba.gov>.

1.10 CLARIFICATIONS AND FINAL PROPOSAL REVISION

1.10.1 General

Any conflicting criteria which cannot be resolved by the Order of Precedence specified in Section 00800 SPECIAL CONTRACT REQUIREMENTS shall be brought to the attention of the Government by the Offeror as part of the written clarification requirement of the proposal. In the absence of such request for clarification, the Offeror shall perform to the most beneficial criteria as determined by the Government.

1.10.2 Clarifications Prior to Proposal Due Date

In the event that clarifications are required prior to submitting the Volume I or II proposal, contact the individuals listed in Section 00100, INSTRUCTIONS TO OFFERORS. All RFP holders will be advised of significant clarifications affecting the scope of the project.

1.10.3 Clarifications Submitted with Proposals

For clarifications remaining at the time and date that proposals are due, written clarifications may be included in the proposal for consideration by the Government. Clarifications submitted with proposals shall clearly identify the understanding of the RFP documents and how this understanding is reflected in the cost proposal. Extensive qualifications, exclusions and exceptions in the form of clarifications may be considered by the Government to be non-responsive and may be grounds for rejection of the proposal.

1.10.4 Final Proposal Revision

If the Contracting Officer determines that discussions are necessary, all offerors in the competitive range will be given an opportunity to submit a final proposal revision. All proposal revisions must be submitted as required in paragraph 1.5.4 Format, subparagraphs 1.5.4.1 Written Material and 1.5.4.2 Drawings.

1.11 PAYMENT FOR PROPOSALS

Offerors will not be reimbursed for the cost of preparing their proposals.

1.12 NOTICE

Failure to submit all the data indicated in this section may be cause for determining a proposal non-responsive and, therefore, not considered for award.

2 PRODUCTS (NOT USED)

3 EXECUTION (NOT USED)

END OF SECTION

SECTION 00150
PROPOSAL EVALUATION AND CONTRACT AWARD
03/2002
AMENDMENT NO. 0005

1 GENERAL

1.1 PROPOSAL EVALUTION

Proposals will be evaluated by a Technical Evaluation Board (TEB). The TEB will be made up of Corps of Engineers and Fort Hood personnel. Board members will not be available for contact or discussion prior to submission of proposals.

1.2 EVALUATION CRITERIA

1.2.1 Volume I Criteria

The Primary Design Construction Team Management proposal evaluation criteria below corresponds to the outline specified in Section 00120 PROPOSAL SUBMISSION REQUIREMENTS, paragraph 1.9.1 Primary Design Construction Team Management Proposal Preparation. Factor A, B and C are of equal importance **AM#4 (and significantly more important than cost/price)** and will be given a quality (AM#4) **adjectival** rating. Sub-factors within each factor are of equal importance, unless identified otherwise. Those offerors with no relevant performance history will be assigned a neutral rating in past performance factor. Factor D will be rated “go” or “no go.”

Volume I – Primary Design Construction Team Management Proposal

A. Project Organization and Personnel

1. Personnel (Prime and Subcontractor).

The TEB will evaluate the adequacy, strengths and weakness of key personnel assignments, to include compliance with registration and/or other specified minimum qualification requirements; qualifications and experience relevant to the proposed project; familiarity with local conditions; and familiarity with applicable building codes and standards.

The TEB will verify that the Designer of Record has been identified for each design discipline and that letters of commitment have been provided for all key personnel on the project team.

The TEB will evaluate the personnel resources assigned to the project and the ability to provide additional resources for the team if supplemental or replacement personnel are required. Consideration will be based on degree of coverage by discipline for all aspects of design and construction’ depth of additional resources to supplement the planned resources, if necessary; whether same-discipline depth is from the same firm/office as the key personnel in that discipline or from a different firm or office.

2. Team Organization and Management

The TEB will evaluate the team structure, the strength of the team organization and the responsibilities for each key individual and firm on the team.

The TEB will evaluate the management structure, delegation of authority, and offeror’s approach to managing the design-build process. The TEB will assess the offeror’s ability to coordinate the design and construction personnel in a team effort, as evidenced by the offeror’s approach to

managing the design-build team, delegation of authority, and team interaction and communication during design and construction.

The TEB will assess the offeror's approach to managing and controlling time during design and construction. Consideration will be given to the scheduling system to be used and compatibility of the offeror's scheduling system with the Government's scheduling system (Primavera, Version 3.1). The offeror's use of the schedule in managing the project will be evaluated.

The TEB will evaluate the work to be self-performed by the offeror (percentage and type). Additional consideration will be given to those offerors that exceed the minimum requirements for work to be self-performed, as identified in the contract clause entitled "Performance of the Work by the Contractor."

The TEB will evaluate the compatibility of proposed CADD system with Government system. Additional consideration will be given for designs prepared in the Government's target CADD system. The amount of consideration will depend on the extent to which the target CADD system is used by the various design disciplines in preparing the design.

B. Experience

1. The offeror will be evaluated based on the recent experiences of the team (firms and/or individual team members). The amount of consideration will depend upon the extent of the offeror's experience, similarity between previous project scopes of work and this project, and the relevance of the offeror's experience to this project. Experience in the following areas will be considered, in decreasing order of importance:

a. Design-build experience. No previous design-build team experience is necessary to qualify for award of this project; however, consideration will be given for recent, successful D-B team experience between the prime construction firm and design firms(s).

b. Experience with vehicle maintenance facilities of similar size and scope. Design, construction, and/or design-build experience are all considered relevant.

c. Sustainable design experience. (AM#5) Consideration will be given to the design team's experience, individual team member or firm, in using sustainable design (SPiRiT or the U.S. Green Building Council's LEED) criteria.

d. Previous experience as a team. Extent to which members of the proposed team have worked together on previous projects as a team will be considered. Design team experience, construction team experience and design-construction team experience are all considered relevant.

e. Experience with Corps of Engineers or other federal contracts. Familiarity with federal regulations and administration of Corps of Engineers or other federal contracts are considered relevant.

f. Experience with design and/or construction at Fort Hood or in the local vicinity. Familiarity with Fort Hood installation requirements and the local vicinity is considered relevant.

C. Past Performance

1. Past performance of the offeror, subcontractors, consultants, and key individuals will be considered in evaluating past performance, utilizing information provided in the proposal and other information available to the Contracting Officer, including but not limited to the following: The following will be considered in descending order of importance:

- a. CCASS (Construction Contract Administration Support System) Evaluations. CCASS evaluations will be utilized to evaluate past performance on Corps of Engineers contracts for construction firms on the offeror's Design-Build team.
- ACASS (A-E Contract Administration Support System) Evaluations. ACASS evaluations will be utilized in evaluating the past performance on Corps of Engineers contracts for Architect-Engineering firms on the offeror's Design-Build team.
- b. Federal Agency Performance Evaluations
- c. Contractor Performance Report From State and local governments and private sector clients. Submitted Contractor Performance Reports may be verified telephonically. References not supported by a Contractor Performance Report may be contacted in writing or telephonically to assess customer satisfaction.
- d. Awards, letters, and other forms of recognition
- e. All other information

D. (AM#5) _____

1.2.2 Volumes II & III Criteria

The evaluation criteria below correspond to the outline specified in Section 00120 PROPOSAL SUBMISSION REQUIREMENTS, paragraph 1.9.2 Volume II – Design Proposal Preparation and 1.9.3 Volume III Cost/Price Proposal Preparation. Factor A is significantly more important than Factor B **(AM#4) and both factors are significantly more important than cost/price**. The sub-factors are listed in decreasing order of importance. Unless noted otherwise, elements within each sub-factor are listed in decreasing order of importance. All sub-factors with in Factor C (Volume III) will be rated “go” or “no-go,” with the exception of cost/price, which will not be rated.

Volume II – Preliminary Design Proposal

A. Design Proposal

- 1. Soundness and quality of design
 - a. Functional aspects of **(AM#4) the Tactical Equipment Shop**
 - b. Durability of materials
 - c. Design rationale
 - d. Compatibility of design and materials with Fort Hood Installation Design Guide
 - e. **(AM#4) Functional aspects of the Option #2 Truck Loading Dock**
- 2. Comfort, aesthetics and amenities
 - a. Deleted (AM#1)
 - b. Environmental Considerations and Occupational Safety and Health Issues
 - c. Site features and site layout **(AM#4) for the Tactical Equipment Shop**
 - d. **Vehicle Service Equipment (AM#5)**
 - e. Energy-efficient and/or energy-saving features
 - f. HVAC system
 - g. Aesthetics of the facility (interior and exterior)
 - h. Facility enhancements
 - i. **(AM#4) Site features and site layout for the Option #2 Truck Loading Dock**
- 3. Sustainable Design (Sustainable Project Rating Tool - SPiRiT criteria):

Goal is to achieve SPiRiT Bronze level certification. Additional consideration will be given for achievement of higher SPiRiT levels. See Volume 4, Attachment J, of the solicitation for the

SPiRiT manual and rating sheets or the Internet web page at
<http://www.cecer.army.mil/Sustdesign/SPiRiT.cfm>.

B. Preliminary Project Schedule

The schedule will be evaluated to assess the offeror's understanding of the design-build process, project scope, phasing requirements, milestones and constraints, and critical elements in design and construction. The design and construction periods offered, the proposed contract durations, and the overall project schedule will be evaluated for realism and for benefits they provide to the Government.

Volume III – Cost/Price Proposal

C. Cost/Price Proposal

1. Standard Form 1442
2. Price proposal schedule, Section 00010
3. Bid Guarantee
4. Representation & Certifications, Section 00600
5. Subcontracting Plan (large businesses only)

The subcontracting plan will be reviewed for compliance and scored in accordance with Army Federal Acquisition Regulation Supplement (AFARS) Appendix CC. Failure to submit an acceptable subcontracting plan may make the offeror ineligible for award of the contract.

6. Small Disadvantaged Business Utilization (SDB) Plan. The SDB utilization plan will be reviewed based on the following criteria:
 - a. The extent to which SDB concerns are specifically identified.
 - b. The extent of commitment to use SDB concerns.
 - c. The complexity and variety of the work SDB concerns are to perform.
 - d. The extent of participation of SDB concerns in terms of the value of the total acquisition.

1.3 DESIGN FREEDOM

REQUIREMENTS STATED IN THIS RFP ARE MINIMUM REQUIREMENTS. Innovative, creative, or cost-saving proposals that meet or exceed these requirements are encouraged and will receive consideration accordingly. Deviations from space and adjacency requirements are discouraged unless the change results in a significant improvement to the facility. Deviations from any requirements should be clearly noted and justified in the proposal. Informative drawing notes are encouraged.

1.4 METHOD OF PROPOSAL EVALUATION

1.4.1 Government's Rights and Goals

The Government reserves the right to reject any or all proposals at any time prior to award; to award a contract to other than the offeror submitting the lowest priced offer; and to award a contract to the offeror submitting the proposal determined to be the most advantageous to the Government. It is the Government's goal to award the

project within its construction cost limitation. Significant variation from this amount could result in the Government's inability to award based on lack of funding authority.

1.4.2 Evaluation Process

All proposals will be reviewed to determine if the minimum data and technical requirements have been met. A proposal may be determined to be unacceptable and therefore eliminated if all the required information is not provided or if the proposal materially deviates from the requirements of the RFP.

Weighing of evaluation criteria will take into consideration not only how important a particular element is to the overall project, but also the innovative, creative, or cost-saving elements which may be incorporated into the proposal (see paragraph "DESIGN FREEDOM") and are advantageous to the Government.

1.4.3 Basis of Award

The Government intends to award a contract without discussions based on initial proposals received; therefore, the offerors proposal should contain the offeror's best terms from a cost and technical standpoint. However, the government reserves the right to conduct discussions in accordance with FAR 52.215-1. . Should discussion be necessary after evaluations, the Government will establish a competitive range of the offerors that are the most highly rated. The Government reserves the right to address any pertinent issues in the proposals.

An award will be made to the offeror whose offer contains the combination of the criteria offering the best overall proposal to the Government based on consideration of technical merit, cost, and other pertinent factors as specified in the RFP. Volume I – Primary Design Construction Team Management proposal is considered more important than Volume II, Preliminary Design Proposal, and will carry more weight in the overall rating of the proposals. **(AM#4) Both Volume I and Volume II are significantly more important than Volume III.** The combined Primary Design Construction Team Management and Preliminary Design proposal rating is significantly more important than Volume III - Cost/Price.

END OF SECTION

SMALL BUSINESS SUBCONTRACTING PLAN

DATE: _____

CONTRACTOR: _____

ADDRESS: _____

SOLICITATION/CONTRACT NUMBER: _____

DESCRIPTION: _____

Our firm has established a policy to afford Small Business concerns, Small Disadvantaged Business concerns, Women-Owned Small Business concerns, Veteran-Owned Small Business, Service-Disabled Veteran-Owned Small Business, Historically Black Colleges and Universities/Minority Institutions, and HUBZone Small Business concerns, opportunities to participate in all contracts with the Department of Defense or any other entities both public and private. *In most instances HBCU/MI are not applicable to construction contracts, but will be included through out this plan with the intent to involve them whenever possible.* Hereinafter these concerns will be identified as “targeted business concerns” unless specifically identified. The following, together with any attachments, is hereby submitted as a Subcontracting Plan to satisfy the applicable requirements of Public Law 99-661, Section 1207 and Public Law 100-180, Section 806.

1. The total estimated dollar value of all planned subcontracting (to all targeted business concerns) under this contract for the Base Bid and all Options is \$_____.

(a) **BASE BID ONLY:** The following percentage goals (expressed in terms of a percentage of total planned subcontracting dollars) and dollar amounts are applicable to the contract cited above or to the contract awarded under the solicitation cited.

(i) Small Business concerns (SB): _____% or \$_____ of total planned subcontracting dollars under this contract will be awarded to subcontractors who are SB.

(ii) Small Disadvantaged Business concerns (SDB): _____% or \$_____ of total planned subcontracting dollars under this contract will be awarded to subcontractors who are small concerns owned and controlled by socially and economically disadvantaged individuals and appear on the Small Business Administration’s Procurement and Marketing and Access Network (PRO-Net). (<http://pro-net.sba.gov>) This percentage is included in the percentage shown under 1.(a)(i) above, as a subset.

(iii) Women-Owned Small Business concerns (WOSB): _____% or \$_____ of total planned subcontracting dollars under this contract will be awarded to subcontractors who are WOSB. This percentage is included in the percentage shown under 1.(a)(i) above, as a subset.

(iv) Veteran-Owned Small Business concerns (VOSB): _____% or \$_____ of total planned subcontracting dollars under this contract will be awarded to subcontractors who are VOSB. This percentage is included in the percentage shown under 1.(a)(i) above, as a subset.

(v) Service-Disabled Veteran-Owned Small Business concerns (SVOSB): _____% or \$_____ of total planned subcontracting dollars under this contract will be awarded to subcontractors who are SVOSB. This percentage is included in the percentage shown under 1.(a)(i) above, as a subset.

(vi) Historically Black Colleges and Universities/Minority Institutions (HBCU/MI): _____% or \$_____ of total planned subcontracting dollars under this contract will go to HBCU's who are an institution determined by the Secretary of Education to meet the requirements of 34 CFR 608.2, the term also includes any nonprofit research institution that was an integral part of such a college or university before November 14, 1986; or MI's who are an institution of higher education meeting the requirements of Section 1046(3) of the Higher Education Act of 1965 (20 U.S.C. 1135d-5(3)) which, includes a Hispanic-serving institution of higher education as defined in Section 316(b)(1) of the Act (20 U.S.C. 1059c(b)(1)). This percentage is included in the percentage shown under 1.(a)(i) above, as a subset.

(vii) HUBZone Small Business concerns: _____% or \$_____ of total planned subcontracting dollars under this contract will go to subcontractors who are small business concerns located in a historically underutilized business zone which is an area located within one or more qualified census tracts, qualified non-metropolitan counties, or lands within the external boundaries of an Indian reservation and appear on the Small Business Administration's Procurement and Marketing and Access Network (PRO-Net). (<http://pro-net.sba.gov>) This percentage is included in the percentage shown under 1.(a)(i) above, as a subset.

The following principal products and/or services will be subcontracted under the Base Bid of this contract, and the distribution among all targeted business concerns is as follows:

Subcontractor Name	Product/Service	SB	SDB	WOSB	VOSB	SVOSB	HBCU MI	HUB- Zone

[Attach additional sheets if necessary]

(b) OPTION 1 ONLY: *(You must include a separate goal for each option)* The following percentage goals (expressed in terms of a percentage of total planned subcontracting dollars) and dollar amounts are applicable to the contract cited above or to the contract awarded under the solicitation cited.

(i) Small Business concerns (SB): _____% or \$_____ of total planned subcontracting dollars under this contract will be awarded to subcontractors who are SB.

(ii) Small Disadvantaged Business concerns (SDB): _____% or \$_____ of total planned subcontracting dollars under this contract will awarded to subcontractors who are small concerns owned and controlled by socially and economically disadvantaged individuals and appear on the Small Business Administration's Procurement and Marketing and Access Network (PRO-Net). (<http://pro-net.sba.gov>) This percentage is included in the percentage shown under 1.(a)(i) above, as a subset.

(iii) Women-Owned Small Business concerns (WOSB): _____% or \$_____ of total planned subcontracting dollars under this contract will be awarded to subcontractors who are WOSB. This percentage is included in the percentage shown under 1.(a)(i) above, as a subset.

(iv) Veteran-Owned Small Business concerns (VOSB): _____% or \$_____ of total planned subcontracting dollars under this contract will be awarded to subcontractors who are VOSB. This percentage is included in the percentage shown under 1.(a)(i) above, as a subset.

(v) Service-Disabled Veteran-Owned Small Business concerns (SVOSB): _____% or \$_____ of total planned subcontracting dollars under this contract will be awarded to subcontractors who are SVOSB. This percentage is included in the percentage shown under 1.(a)(i) above, as a subset.

(vi) Historically Black Colleges and Universities/Minority Institutions (HBCU/MI): _____% or \$_____ of total planned subcontracting dollars under this contract will go to HBCU's who are an institution determined by the Secretary of Education to meet the requirements of 34 CFR 608.2, the term also includes any nonprofit research institution that was an integral part of such a college or university before November 14, 1986; or MI's who are an institution of higher education meeting the requirements of Section 1046(3) of the Higher Education Act of 1965 (20 U.S.C. 1135d-5(3)) which, includes a Hispanic-serving institution of higher education as defined in Section 316(b)(1) of the Act (20 U.S.C. 1059c(b)(1)). This percentage is included in the percentage shown under 1.(a)(i) above, as a subset.

(vii) HUBZone Small Business concerns: _____% or \$_____ of total planned subcontracting dollars under this contract will go to subcontractors who are small business concerns located in a historically underutilized business zone which is an area located within one or more qualified census tracts, qualified non-metropolitan counties, or lands within the external boundaries of an Indian reservation and appear on the Small Business Administration's Procurement and Marketing and Access Network (PRO-Net). (<http://pro-net.sba.gov>) This percentage is included in the percentage shown under 1.(a)(i) above, as a subset.

The following principal products and/or services will be subcontracted under Option 1 of this contract, and the distribution among all targeted business concerns is as follows:

Subcontractor Name	Product/Service	SB	SDB	WOSB	VOSB	SVOSB	HBCU MI	HUB- Zone

[Attach additional sheets if necessary]

(c) **OPTION 2 ONLY:** *(You must include a separate goal for each option)* The following percentage goals (expressed in terms of a percentage of total planned subcontracting dollars) and dollar amounts are applicable to the contract cited above or to the contract awarded under the solicitation cited.

(i) Small Business concerns (SB): _____% or \$_____ of total planned subcontracting dollars under this contract will be awarded to subcontractors who are SB.

(ii) Small Disadvantaged Business concerns (SDB): _____% or \$_____ of total planned subcontracting dollars under this contract will awarded to subcontractors who are small concerns owned and controlled by socially and economically disadvantaged individuals and appear on the Small Business Administration's Procurement and Marketing and Access Network (PRO-Net). (<http://pro-net.sba.gov>) This percentage is included in the percentage shown under 1.(a)(i) above, as a subset.

(iii) Women-Owned Small Business concerns (WOSB): _____% or \$_____ of total planned subcontracting dollars under this contract will be awarded to subcontractors who are WOSB. This percentage is included in the percentage shown under 1.(a)(i) above, as a subset.

(iv) Veteran-Owned Small Business concerns (VOSB): _____% or \$_____ of total planned subcontracting dollars under this contract will be awarded to subcontractors who are AVOSB. This percentage is included in the percentage shown under 1.(a)(i) above, as a subset.

(v) Service-Disabled Veteran-Owned Small Business concerns (SVOSB): _____% or \$_____ of total planned subcontracting dollars under this contract will be awarded to subcontractors who are SVOSB. This percentage is included in the percentage shown under 1.(a)(i) above, as a subset.

(vi) Historically Black Colleges and Universities/Minority Institutions (HBCU/MI): _____% or \$_____ of total planned subcontracting dollars under this contract will go to HBCU's who are an institution determined by the Secretary of Education to meet the requirements of 34 CFR 608.2, the term also includes any nonprofit research institution that was an integral part of such a college or university before November 14, 1986; or MI's who are an institution of higher education meeting the requirements of Section 1046(3) of the Higher Education Act of 1965 (20 U.S.C. 1135d-5(3)) which, includes a Hispanic-serving institution of higher education as defined in Section 316(b)(1) of the Act (20 U.S.C. 1059c(b)(1)). This percentage is included in the percentage shown under 1.(a)(i) above, as a subset.

(vii) HUBZone Small Business concerns: _____% or \$_____ of total planned subcontracting dollars under this contract will go to subcontractors who are small business concerns located in a historically underutilized business zone which is an area located within one or more qualified census tracts, qualified non-metropolitan counties, or lands within the external boundaries of an Indian reservation and appear on the Small Business Administration's Procurement and Marketing and Access Network (PRO-Net). (<http://pro-net.sba.gov>) This percentage is included in the percentage shown under 1.(a)(i) above, as a subset.

The following principal products and/or services will be subcontracted under Option 1 of this contract, and the distribution among all targeted business concerns is as follows:

Subcontractor Name	Product/Service	SB	SDB	WOSB	VOSB	SVOSB	HBCU MI	HUB- Zone

[Attach additional sheets if necessary]

(d) The following method was used in developing subcontract goals (i.e., statement explaining how the product and service areas to be subcontracted were established, how the areas to be subcontracted to the targeted business concerns were determined, and how each concern's capabilities were determined, to include identification of source lists utilized in making that determination).

(e) Indirect and overhead costs ☐ have ☐ have not been included in the goals specified in l(a), l(b), and l(c).

(f) If “have” is checked, explain the method used in determining the proportionate share of indirect and overhead Cost to be allocated as subcontracts to each targeted business concern mentioned.

2. The following individual will administer the subcontracting program:

Name: _____
Title: _____
Telephone: _____
Fax: _____

This individual’s specific duties, as they relate to the firm’s subcontracting program are as follows:

General overall responsibility for this company’s Small Business Program, the development, preparation and execution of individual subcontracting plans and for monitoring performance relative to contractual subcontracting requirements contained in this plan, including but not limited to:

(a) Developing and maintaining bidders lists of targeted business firms from all possible sources.

(b) Ensuring that procurement packages are structured to permit targeted business concerns to participate to the maximum extent possible.

(c) Assuring inclusion of SB, SDB, WOSB, VOSB, SVOSB, HBCU/MI, and HUBZone SB in all solicitations for products or services, which they are capable of providing.

(d) Reviewing solicitations to remove statements, clauses, etc., which may tend to restrict or prohibit participation by any or all of the targeted business concerns.

(e) Ensuring periodic rotation of potential subcontractors on bidders' lists.

(f) Ensuring that the bid proposal review board documents its reasons for rejecting low bids submitted by any targeted business concern(s).

(g) Ensuring the establishment and maintenance of records of solicitations and subcontract award activity.

(h) Attending or arranging for attendance of company counselors at Business Opportunity Workshops, Minority Business Enterprise Seminars, Trade Fairs, etc.

(i) Conducting or arranging for conduct of motivational training for purchasing personnel pursuant to the intent of Public Laws 99-661 and 100-180.

(j) Monitoring attainment of proposed goals.

(k) Preparing and submitting periodic subcontracting reports required.

(l) Coordinating contractor's activities during the conduct of compliance reviews by Federal Agencies.

(m) Coordinating the conduct of contractor's activities involving its small business subcontracting program.

(n) Additions to (or deletions from) the duties specified above are as follows:

3. The following efforts will be taken to assure that all targeted business concerns will have an equitable opportunity to compete for subcontracts:

(a) Outreach efforts will be made as follows:

(i) Contacts with minority and small business trade associations

(ii) Contacts with business development organizations

(iii) Attendance at small and minority business procurement conferences

(iv) Sources will be requested from SBA's PRO-Net system.

(b) The following internal efforts will be made to guide and encourage buyers:

(i) Workshops, seminars and training programs will be conducted

(ii) Activities will be monitored to evaluate compliance with this subcontracting plan.

(c) SB, SDB, WOSB, VOSB, SVOSB, HBCU/MI, and HUBZone SB source lists, guides and other data identifying these targeted business concerns will be maintained and utilized by buyers in soliciting subcontracts.

(d) Additions to (or deletions from) the above listed efforts are as follows:

4. The contractor agrees that the clause entitled Utilization of Small, HUBZone Small, Small Disadvantaged, Veteran-Owned Small Business, and Women-Owned Small Business concerns will be included in all subcontracts, which offer further subcontracting opportunities, and all subcontractors except small business concerns who receive subcontracts in excess of \$500,000 (\$1,000,000 for construction of any public facility) will be required to adopt and comply with a subcontracting plan similar to this one. Such plans will be reviewed by comparing them with the provisions of Public Law 95-507, and assuring that all minimum requirements of an acceptable subcontracting plan have been satisfied. The acceptability of percentage goals shall be determined on a case-by-case basis depending on the supplies/services involved, the availability of potential SB, SDB, WOSB, VOSB, SVOSB, HBCU/MI, and HUBZone SB contractors, and prior experience. Once approved and implemented, plans will be monitored through the submission of periodic reports, and/or, as time and availability of funds permit, periodic visits to subcontractors facilities to review applicable records and subcontracting program progress.

5. The contractor agrees to submit such periodic reports and cooperate in any studies or surveys as may be required by the contracting agency or the Small business Administration in order to determine the extent of compliance by the bidder with the subcontracting plan and with the clause entitled Utilization of Small Business concerns, contained in the contract.

6. The contractor agrees that he will maintain at least the following types of records to document compliance with this subcontracting plan:

(a) Lists, guides and other data identifying specific SB, SDB, WOSB, VOSB, SVOSB, HBCU/MI, and HUBZone SB firms/vendors and their capabilities.

(b) Organizations contacted for sources of firms representing the individual targeted business concerns.

(c) On a contract-by-contract basis, records on all subcontract solicitations over \$100,000, indicating on each solicitation (1) whether SBs were solicited, and if not, why not; (2) whether SDBs were solicited, and if not, why not; (3) whether WOSBs were solicited, and if not, why not; (4) whether VOSBs were solicited and if not, why not; (5) whether HBCU/MI concerns were solicited and if not, why not; (6) whether HUBZone SBs were solicited and if not, why not; and (7) reasons for the failure of solicited targeted business concerns to receive the subcontract award.

(d) Records to support other outreach efforts: Contacts with Minority and Small Business Trade Associations, etc. Attendance at small and minority business procurement conferences and trade fairs.

(e) Records to support internal activities to guide and encourage buyers: Workshops, seminars, training programs, etc. Monitoring activities to evaluate compliance.

(f) On a contract-by-contract basis, records to support subcontract award data to include name and address or subcontractor.

(g) Records to be maintained in addition to the above are as follows:

Signed: _____
Typed Name: _____
Title: _____
Date: _____

CHAPTER 00840

REFERENCED DOCUMENTS

APPLICABILITY

- A. The following documents form a part of the Request for Proposal to the extent they are referenced elsewhere herein.

GOVERNMENT REGULATIONS AND PUBLICATIONS

- A. CFR - Code of Federal Regulations, United States Government:
1. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Consumer Product Safety Commission; 1977, with 1984 Revision.
 2. 28 CFR 36 - Nondiscrimination by Public Accommodations and in Commercial Facilities; Final Rule; Department of Justice; Federal Register, July 26, 1991.
 3. 29 CFR 1910 - Occupational Safety and Health Standards; Occupational Safety and Health Administration; 1997.
 4. Deleted (am#5).
 5. 49 CFR 27, 37, and 38 - Transportation for Individuals with Disabilities; Final Rule; Department of Transportation; Federal Register, September 6, 1991.
- B. U.S. Government Voluntary Standards:
1. FED-STD-795 - Uniform Federal Accessibility Standards; April 1, 1988 (UFAS).
 2. FS SS-T-312 - Tile, Floor: Asphalt, Rubber, Vinyl, and Vinyl Composition; Revision B, 1974, and Amendment 1, 1979.
 3. FS RR-T-650 - Treads, Metallic and Nonmetallic, Skid Resistant; Revision E, 1994.
 4. FS TT-P-115 - Paint, Traffic (Highway, White and Yellow); Revision F, 1984.
 5. PS 1 - Construction and Industrial Plywood; 1995.
 6. PS 20 - American Softwood Lumber Standard; 1999.
 7. MIL-HDBK-1008C (10 June 1997) Fire Protection For Facilities Engineering, Design and Construction.
 8. SWD Architectural and Engineering Instructions Manual (SWD-AEIM), October 2000.
 9. Installation Design Guide.

MODEL CODE ORGANIZATIONS

- A. ICC - International Code Council, Inc.:
1. ICC (IBC) - International Building Code; 2000 edition.
 2. ICC (IFC) - International Fire Code; 2000 edition.
 3. ICC (IFGC) - International Fuel Gas Code; 2000 edition.
 4. ICC (IMC) - International Mechanical Code; 2000 edition.
 5. ICC (IPC) - International Plumbing Code; 2000 edition.

NON-GOVERNMENTAL STANDARDS DEVELOPING ORGANIZATIONS

- A. AAMA - American Architectural Manufacturers Association:

1. AAMA 1503.1 - Voluntary Test Method for Thermal Transmission and Condensation Resistance of Windows, Doors, and Glazed Wall Sections; 1998.
 2. AAMA GDSG-1 - Glass Design for Sloped Glazing; 1987.
 3. AAMA/NWWDA 101/I.S.2 - Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors; 1997, and revisions of Reprinting of 1999
- B. AASHTO - American Association of State Highway and Transportation Officials:
1. AASHTO GDPS-4 - Guide for Design of Pavement Structures, Volume 1, 1993; and GDPS3-V2, Volume 2, 1986.
 2. AASHTO GDHS-3 - A Policy on Geometric Design of Highways and Streets; 1994.
- C. AATCC - American Association of Textile Chemists & Colorists:
1. AATCC Test Method 16 - Test Method for Colorfastness to Light; 1993 (Reaffirmed 1998).
 2. AATCC Test Method 134 - Electrostatic Propensity of Carpets; 1996.
- D. ACI - American Concrete Institute International:
1. ACI 301 - Specifications for Structural Concrete; 1999.
 2. ACI 302.1R - Guide for Concrete Floor and Slab Construction; 1996.
 3. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 1989 (Reapproved 1997).
 4. ACI 305R - Hot Weather Concreting; 1999.
 5. ACI 306R - Cold Weather Concreting; 1988.
 6. ACI 308 - Standard Practice for Curing Concrete; 1992 (Reapproved 1997).
 7. ACI 336.1 - Reference Specification for the Construction of Drilled Piers; 1998.
 8. ACI 530.1/ASCE 6/TMS 602 - Specification for Masonry Structures; 1999.
 9. ACI SP-66 - ACI Detailing Manual; 1994.
- E. AFPA - American Forest and Paper Association:
1. AFPA WCD 1 T11 - Manual for Wood Frame Construction; 1988.
- F. AGA - American Gas Association:
1. AGA (DIR) - Directory of Certified Appliances and Accessories; 1998.
- G. AHA - American Hardboard Association:
1. AHA A135.4 - Basic Hardboard; 1995.
- H. AMCA - Air Movement and Control Association, Inc.:
1. ANSI/AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating; 1999.
- I. ANSI - American National Standards Institute (for documents designated ANSI/XXXX, see organization XXXX):
1. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 1992.
 2. ANSI A108.1 - American National Standard for Installation of Ceramic Tiles; 1999.
 3. ANSI A108.1A - American National Standard Specifications for Installation of Ceramic Tile in the

Wet-Set Method, with Portland Cement Mortar; 1999.

4. ANSI A108.1B - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar; 1999.
 5. ANSI A118.1 - American National Standard Specifications for Dry-Set Portland Cement Mortar; 1999.
 6. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive; 1999.
 7. ANSI A118.4 - American National Standard Specifications for Latex-Portland Cement Mortar; 1999.
 8. ANSI A118.5 - American National Standard Specifications for Chemical Resistant Furan Mortars and Grouts for Tile Installation; 1999.
 9. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation; 1999.
 10. ANSI A118.7 - American National Standard Specifications for Polymer Modified Cement Grouts for Tile Installation; 1999.
 11. ANSI A136.1 - American National Standard for Organic Adhesives for Installation of Ceramic Tile; 1999.
 12. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 1988.
 13. ANSI A208.1 - American National Standard for Particleboard; 1999.
 14. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 1994.
 15. ANSI A250.6 - Hardware on Steel Doors (Reinforcement--Application); 1997.
 16. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 1998.
 17. ANSI Z60.1 - American National Standard for Nursery Stock; 1996.
 18. ANSI Z124.3 - American National Standard for Plastic Lavatories; 1995.
- J. AOSA - Association of Official Seed Analysts:
1. AOSA RULES - Rules for Testing Seeds; 1998, revised 1999.
- K. ARI - Air-Conditioning and Refrigeration Institute:
1. ARI 210/240 - Unitary Air-Conditioning and Air Source Heat Pump Equipment; 1994.
 2. ARI 310/380 - Packaged Terminal Air-Conditioners and Heat Pumps; 1993.
 3. ARI 340/360 - Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment; 1993.
 4. ARI 365 - Commercial and Industrial Unitary Air-Conditioning Condensing Units; 1994.
 5. ANSI/ARI 550/590 - Standard for Water Chilling Packages Using the Vapor Compression Cycle; 1998, Addendum June 1999.
 6. ARI 880 - Air Terminals; 1998.
 7. ARI 1010 - Self-Contained, Mechanically Refrigerated Drinking-Water Coolers; 1994.
- L. ASCE - American Society of Civil Engineers:

1. ANSI/ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 1998 (pub. 2000).
- M. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers:
1. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; 1999.
 2. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; 1997.
 3. ASHRAE Std 15 - Safety Code for Mechanical Refrigeration; 1994.
 4. ASHRAE Std 52.1 - Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter; 1992.
 5. ANSI/ASHRAE Std 55 - Thermal Environmental Conditions for Human Occupancy; 1992 with Addendum.
 6. ANSI/ASHRAE Std 62 - Ventilation for Acceptable Indoor Air Quality; 1999.
 7. ASHRAE Std 90.1 - Energy Efficient Design of new Buildings Except Low-Rise Residential Buildings; 1999.
- N. ASME - American Society of Mechanical Engineers:
1. ANSI/ASME A13.1 - Scheme for the Identification of Piping Systems; 1996.
 2. ASME A17.1 - Safety Code for Elevators and Escalators; 2000.
 3. ANSI/ASME A112.21.1M - Floor Drains; 1991 (R1998).
 4. ANSI/ASME A112.21.2M - Roof Drains; 1991 (R1998).
 5. ANSI B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 1984 (Reapproved 1994).
 6. ANSI/ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; 1995, 1998 Addenda.
 7. ANSI/ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV; 1992.
 8. ANSI/ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 1988.
 9. ANSI/ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV; 1994.
 10. ASME (BPV IV) - Boiler and Pressure Vessel Code, Section IV, Rules for Construction of Heating Boilers; 1998.
- O. ASTM - American Society for Testing and Materials:
1. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 2000a.
 2. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2000.
 3. ASTM A 74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 1998.
 4. ASTM A 82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 1997a.
 5. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2000.
 6. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2000.
 7. ASTM A 307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength; 2000.

8. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2000.
9. ASTM A 325M - Standard Specification for High-Strength Bolts for Structural Steel Joints (Metric); 2000.
10. ASTM A 366/A 366M - Standard Specification for Commercial Steel (CS) Sheet, Carbon, (0.15 Maximum Percent) Cold-Rolled; 1997.
11. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 1999.
12. ASTM A 501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 1999.
13. ASTM A 510 - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel; 2000.
14. ASTM A 510M - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel (Metric); 2000.
15. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2001.
16. ASTM A 641/A 641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 1998.
17. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2000.
18. ASTM A 951 - Standard Specification for Masonry Joint Reinforcement; 2000.
19. ASTM B 42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 1998.
20. ASTM B 43 - Standard Specification for Seamless Red Brass Pipe, Standard Sizes; 1998.
21. ASTM B 68 - Standard Specification for Seamless Copper Tube, Bright Annealed; 1999.
22. ASTM B 68M - Standard Specification for Seamless Copper Tube, Bright Annealed (Metric); 1999.
23. ASTM B 75 - Standard Specification for Seamless Copper Tube; 1999.
24. ASTM B 75M - Standard Specification for Seamless Copper Tube (Metric); 1999.
25. ASTM B 88 - Standard Specification for Seamless Copper Water Tube; 1999.
26. ASTM B 88M - Standard Specification for Seamless Copper Water Tube (Metric); 1999.
27. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2000.
28. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2000.
29. ASTM B 280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 1999.
30. ASTM B 306 - Standard Specification for Copper Drainage Tube (DWV); 1999.
31. ASTM C 4 - Standard Specification for Clay Drain Tile and Perforated Clay Drain Tile; 2000.
32. ASTM C 14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe; 1999.
33. ASTM C 14M - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe

- (Metric); 1999.
34. ASTM C 36/C 36M - Standard Specification for Gypsum Wallboard; 1999.
 35. ASTM C 76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; 2000.
 36. ASTM C 76M - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe (Metric); 2000.
 37. ASTM C 90 - Standard Specification for Loadbearing Concrete Masonry Units; 2001.
 38. ASTM C 94/C 94M - Standard Specification for Ready-Mixed Concrete; 2000.
 39. ASTM C 129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2000a.
 40. ASTM C 150 - Standard Specification for Portland Cement; 2000.
 41. ASTM C 216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2000.
 42. ASTM C 236 - Standard Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box; 1989 (Reapproved 1993).
 43. ASTM C 270 - Standard Specification for Mortar for Unit Masonry; 2000.
 44. ASTM C 404 - Standard Specification for Aggregates for Masonry Grout; 1997.
 45. ASTM C 423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2000.
 46. ASTM C 425 - Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings; 2000.
 47. ASTM C 475 - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 1994.
 48. ASTM C 476 - Standard Specification for Grout for Masonry; 2001.
 49. ASTM C 564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 1997.
 50. ASTM C 568 - Standard Specification for Limestone Dimension Stone; 1999.
 51. ASTM C 578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2000.
 52. ASTM C 635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2000.
 53. ASTM C 645 - Standard Specification for Nonstructural Steel Framing Members; 2000.
 54. ASTM C 700 - Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated; 2000.
 55. ASTM C 754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2000.
 56. ASTM C 755 - Standard Practice for Selection of Vapor Retarders for Thermal Insulation; 1997.
 57. ASTM C 836 - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course; 2000.
 58. ASTM C 840 - Standard Specification for Application and Finishing of Gypsum Board; 1999a.
 59. ASTM C 864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets,

- Setting Blocks, and Spacers; 1999.
60. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants; 1998.
 61. ASTM C 1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2000.
 62. ASTM C 1048 - Standard Specification for Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass; 1997b.
 63. ASTM C 1053 - Standard Specification for Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications; 2000.
 64. ASTM C 1142 - Standard Specification for Extended Life Mortar for Unit Masonry; 1995.
 65. ASTM C 1184 - Standard Specification for Structural Silicone Sealants; 2000a.
 66. ASTM C 1193 - Standard Guide for Use of Joint Sealants; 2000.
 67. ASTM C 1199 - Standard Test Method for Measuring the Steady State Thermal Transmittance of Fenestration Systems Using Hot Box Methods; 2000.
 68. ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 1997a.
 69. ASTM D 312 - Standard Specification for Asphalt Used in Roofing; 2000.
 70. ASTM D 449 - Standard Specification for Asphalt Used in Dampproofing and Waterproofing; 1989 (Reapproved 1999).
 71. ASTM D 1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 1999.
 72. ASTM D 2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine; 1999.
 73. ASTM D 2178 - Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing; 1997a.
 74. ASTM D 2239 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter; 1999.
 75. ASTM D 2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2000.
 76. ASTM D 2447 - Standard Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter; 1999.
 77. ASTM D 2513 - Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings; 2000.
 78. ASTM D 2609 - Standard Specification for Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe; 2000.
 79. ASTM D 2662 - Standard Specification for Polybutylene (PB) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter; 1996a.
 80. ASTM D 2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2000.
 81. ASTM D 2666 - Standard Specification for Polybutylene (PB) Plastic Tubing; 1996a.
 82. ASTM D 2680 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl

- Chloride) (PVC) Composite Sewer Piping; 1995a.
83. ASTM D 2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing; 1998.
 84. ASTM D 2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 1996a.
 85. ASTM D 2846/D 2846M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems; 1999.
 86. ASTM D 3000 - Standard Specification for Polybutylene (PB) Plastic Pipe (SDR-PR) Based on Outside Diameter; 1995a.
 87. ASTM D 3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2000.
 88. ASTM D 3262 - Standard Specification for "Fiberglass" (Glass Fiber-Reinforced Thermosetting-Resin) Sewer Pipe; 1996.
 89. ASTM D 3309 - Standard Specification for Polybutylene (PB) Plastic Hot- and Cold-Water Distribution Systems; 1996a.
 90. ASTM D 3462 - Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules; 2000.
 91. ASTM D 3840 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Fittings for Nonpressure Applications; 1999.
 92. ASTM D 4869 - Standard Specification for Asphalt-Saturated Organic Felt Shingle Underlayment Used in Roofing; 1988 (Reapproved 1993).
 93. ASTM D 4897 - Standard Specification for Asphalt-Coated Glass-Fiber Venting Base Sheet Used in Roofing; 1998.
 94. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction; 1998.
 95. ASTM E 84 - Standard Test Methods for Surface Burning Characteristics of Building Materials; 2000a.
 96. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 1999.
 97. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials; 2000.
 98. ASTM E 108 - Standard Test Methods for Fire Tests of Roof Coverings; 2000.
 99. ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 1991 (Reapproved 1999).
 100. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference; 1997.
 101. ASTM E 336 - Standard Test Method for Measurement of Airborne Sound Insulation in Buildings; 1997.
 102. ASTM E 413 - Classification for Rating Sound Insulation; 1987 (Reapproved 1999).
 103. ASTM E 580 - Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Requiring Seismic Restraint; 2000.

104. ASTM E 736 - Standard Test Method for Cohesion/Adhesion of Sprayed Fire Resistive Materials Applied to Structural Members; 2000.
105. ASTM E 760 - Standard Test Method for Effect of Impact on Bonding of Sprayed Fire Resistive Material Applied to Structural Members; 1992 (Reapproved 2000).
106. ASTM E 761 - Standard Test Method for Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members; 1992 (Reapproved 2000).
107. ASTM E 773 - Standard Test Method for Accelerated Weathering of Sealed Insulating Glass Units; 1997.
108. ASTM E 774 - Standard Specification for the Classification of the Durability of Sealed Insulating Glass Units; 1997.
109. ASTM E 814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2000.
110. ASTM E 966 - Standard Guide for Field Measurement of Airborne Sound Insulation of Building Facades and Facade Elements; 1999.
111. ASTM E 1007 - Standard Test Method for Field Measurement of Tapping Machine Impact Sound Transmission Through Floor-Ceiling Assemblies and Associated Support Structures; 1997.
112. ASTM E 1264 - Standard Classification for Acoustical Ceiling Products; 1998.
113. ASTM E 1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2000.
114. ASTM E 1352 - Standard Test Methods for Cigarette Ignition Resistance of Mock-Up Upholstered Furniture Assemblies; 1999.
115. ASTM E 1477 - Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers; 1998a.
116. ASTM E 1537 - Standard Test Method for Fire Testing of Upholstered Furniture Items; 1999.
117. ASTM E 1677 - Standard Specification for Air Retarder (AR) Material or System for Low-Rise Framed Building Walls; 1995 (Reapproved 2000).
118. ASTM F 441/F 441M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80; 1999.
119. ASTM E 1592 (2001) Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
120. ASTM F 442/F 442M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR); 1999.
121. ASTM F 476 - Standard Test Methods for Security of Swinging Door Assemblies; 1984 (Reapproved 1996).
122. ASTM F 588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact; 1997.
123. ASTM F 679 - Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings; 2001.
124. ASTM F 793 - Standard Classification of Wallcovering by Durability Characteristics; 1993 (Reapproved 1998).
125. ASTM F 809/F 809M - Standard Specification for Large Diameter Polybutylene Plastic Pipe; 1995.
126. ASTM F 842 - Standard Test Methods for Measurement of Forced Entry Resistance of

Horizontal Sliding Door Assemblies, Excluding Glazing Impact; 1997.

127. ASTM F 845 - Standard Specification for Plastic Insert Fittings for Polybutylene (PB) Tubing; 1996.

128. ASTM F 1066 - Standard Specification for Vinyl Composition Floor Tile; 1999.

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130. ASTM F 1281 - Standard Specification for Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe; 2001.

131. ASTM F 1282 - Standard Specification for Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe; 2001.

132. ASTM F 1700 - Standard Specification for Solid Vinyl Floor Tile; 1999.

P. AWI - Architectural Woodwork Institute:

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Q. AWWA - American Water Works Association:

1. AWWA C2 - Lumber, Timber, Bridge Ties and Mine Ties -- Preservative Treatment by Pressure Processes; 2000.
2. AWWA C3 - Piles -- Preservative Treatment By Pressure Processes; 1999.
3. AWWA C14 - Wood for Highway Construction -- Preservative Treatment By Pressure Processes; 1999.
4. AWWA C20 - Structural Lumber -- Fire-Retardant Treatment by Pressure Processes; 1999.

R. AWS - American Welding Society:

1. AWS D1.1 - Structural Welding Code - Steel; 2000.

S. AWWA - American Water Works Association:

1. ANSI/AWWA C104/A21.4 - American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water; 1995.
2. ANSI/AWWA C110 - American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (75 mm Through 1200 mm), for Water and Other Liquids; 1998.
3. ANSI/AWWA C111/A21.11 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 1995.
4. ANSI/AWWA C151/A21.51 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water; 1996.
5. ANSI/AWWA C153/A21.53 - American National Standard for Ductile-Iron Compact Fittings, 3 In. Through 24 In. (76mm Through 610 mm) and 54 In. Through 64 In. (1400 mm Through 1600 mm), for Water Service; 1994.
6. ANSI/AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In., for Water Distribution; 1997.

T. BHMA - Builders Hardware Manufacturers Association:

1. ANSI/BHMA A156.1 - American National Standard for Butts and Hinges; 2000.
2. ANSI/BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches; 1996.

3. ANSI/BHMA A156.3 - American National Standard for Exit Devices; 1994.
 4. ANSI/BHMA A156.4 - American National Standard for Door Controls - Closers; 2000.
 5. ANSI/BHMA A156.5 - American National Standard for Auxiliary Locks & Associated Products; 1992.
 6. ANSI/BHMA A156.6 - American National Standard for Architectural Door Trim; 1994.
 7. ANSI/BHMA A156.7 - American National Standard for Template Hinge Dimensions; 1988 (R1997).
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 9. ANSI/BHMA A156.10 - American National Standard for Power Operated Pedestrian Doors; 1999.
 10. ANSI/BHMA A156.12 - American National Standard for Interconnected Locks & Latches; 1999.
 11. ANSI/BHMA A156.13 - American National Standard for Mortise Locks & Latches; 1994.
 12. ANSI/BHMA A156.14 - American National Standard for Sliding & Folding Door Hardware; 1997.
 13. ANSI/BHMA A156.15 - American National Standard for Closer Holder Release Devices; 1995.
 14. ANSI/BHMA A156.16 - American National Standard for Auxiliary Hardware; 1997.
 15. ANSI/BHMA A156.18 - American National Standard for Materials and Finishes; 2000.
 16. ANSI/BHMA A156.19 - American National Standard for Power Assist and Low Energy Power Operated Doors; 1997.
 17. ANSI/BHMA A156.21 - American National Standard for Thresholds; 1996.
- U. BIFMA - Business and Institutional Furniture Manufacturers Association:
1. ANSI/BIFMA X5.6 - American National Standard for Office Furnishings -- Panel Systems -- Tests; 1993.
- V. CISPI - Cast Iron Soil Pipe Institute:
1. CISPI 301 - Cast Iron Soil Pipe Institute:Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; 1997
- W. CLFMI - Chain Link Fence Manufacturers Institute:
1. CLFMI CLF 2445 - Product Manual; 1997.
- X. CRI - Carpet and Rug Institute:
1. CRI 104 - Standard for Installation of Commercial Textile Floorcovering Materials; 1996.
- Y. EIA - Electronic Industries Association: See TIA.
- Z. EIMA - EIFS Industry Members Association:
1. EIMA 101.86 - Standard Test Method for Resistance of Exterior Insulation and Finish Systems (EIFS), Class PB to the Effects of Rapid Deformation (Impact); 1995, Revised August 1995.
- AA. GA - Gypsum Association:
1. GA-600 - Fire Resistance Design Manual; 2000.
- AB. GANA - Glass Association of North America:
1. GANA (SM) - FGMA Sealant Manual; 1990.

2. GANA (GM) - GANA Glazing Manual; 1997.

AC. HPVA - Hardwood Plywood & Veneer Association:

1. ANSI/HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2000.

AD. IEEE - The Institute of Electrical and Electronics Engineers:

1. IEEE 142 - IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems; 1991.
2. IEEE 739 - IEEE Recommended Practice for Energy Management in Industrial and Commercial Facilities; 1995.
3. IEEE 1100 - IEEE Recommended Practice for Powering and Grounding Sensitive Electronic Equipment; 1999.
4. IEEE C57.12.00 - General Requirements for Liquid Immersed Distribution, Power, and Regulating Transformers; 2000.

AE. IESNA - Illuminating Engineering Society of North America:

1. IESNA (LH) - Lighting Handbook; 2000.
2. IESNA RP-5 - Recommended Practice of Daylighting; 1999.
3. ANSI/IESNA RP-8 - American National Standard Practice for Roadway Lighting; 2000.

AF. LPI - Lightning Protection Institute:

1. LPI-175 - Standard of Practice; 1987.

AG. MSS - Manufacturers Standardization Society of the Valve and Fittings Industry:

1. MSS SP-67 - Butterfly Valves; 1995.
2. MSS SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends; 1998.
3. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 1997.
4. MSS SP-85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends; 1994.
5. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 1996.

AH. NAAMM - National Association of Architectural Metal Manufacturers:

1. NAAMM HMMA 860 - Guide Specifications for Hollow Metal Doors and Frames; 1992.
2. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2000.
3. NAAMM HMMA 862 - Guide Specifications for Commercial Security Hollow Metal Doors and Frames; 1987.
4. NAAMM MBG 531 - Metal Bar Grating Manual; 1993.
5. NAAMM ML/SFA 920 - Guide Specifications for Metal Lathing and Furring; 1991.

AI. NACE - NACE International:

1. NACE RP0169 - Standard Recommended Practice, Control of External Corrosion on Underground or Submerged Metallic Piping Systems; 1996.
2. NACE RP0285 - Standard Recommended Practice, Corrosion Control of Underground Storage Tank Systems by Cathodic Protection; 1995.

3. NACE TM0497 - Measurement Techniques Related to Criteria for Cathodic Protection on Underground or Submerged Metallic Piping Systems; 1997.

AJ. NEMA - National Electrical Manufacturers Association:

1. NEMA LD 3 - High-Pressure Decorative Laminates; 1995.

AK. NFPA - National Fire Protection Association:

1. NFPA 10 - Standard for Portable Fire Extinguishers; 1998.
2. NFPA 11 - Standard for Low-Expansion Foam; 1998.
3. NFPA 11A - Standard for Medium- and High-Expansion Foam Systems; 1999.
4. NFPA 12A - Standard on Halon 1301 Fire Extinguishing Systems; 1997.
5. NFPA 13 - Standard for the Installation of Sprinkler Systems; 1999.
6. NFPA 14 - Standard for the Installation of Standpipe, Private Hydrant, and Hose Systems; 2000.
7. NFPA 16 - Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems; 1999.
8. NFPA 17 - Standard for Dry Chemical Extinguishing Systems; 1998.
9. NFPA 20 - Standard for the Installation of Stationary Pumps for Fire Protection; 1999.
10. NFPA 25 - Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems; 1998.
11. NFPA 70 - National Electrical Code; 2002.
12. NFPA 72 - National Fire Alarm Code; 1999.
13. NFPA 80 - Standard for Fire Doors and Fire Windows; 1999.
14. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; 2000.
15. NFPA 204 - Guide for Smoke and Heat Venting; 1998.
16. NFPA 261 - Standard Method of Test for Determining Resistance of Mock-Up Upholstered Furniture Material Assemblies to Ignition by Smoldering Cigarettes; 1998.
17. NFPA 266 - Standard Test Method for Fire Characteristics of Upholstered Furniture Exposed to Flaming Ignition Source; 1998.
18. NFPA 701 - Standard Method of Fire Tests for Flame Propagation of Textiles and Films; 1999.

AL. PCI - Precast/Prestressed Concrete Institute:

1. PCI MNL-116 - Manual for Quality Control for Plants and Production of Structural Precast Concrete Products; 1999.
2. PCI MNL-120 - PCI Design Handbook - Precast and Prestressed Concrete; Precast/Prestressed Concrete Institute; 1999.
3. PCI MNL-123 - Design and Typical Details of Connections for Precast and Prestressed Concrete; 1988, Second Edition.

AM. SDI - Steel Deck Institute:

1. SDI (DM) - Publication No. 29, Design Manual for Composite Decks, Form Decks, Roof Decks and Cellular Deck Floor Systems with Electrical Distribution; 1995.
2. SDI MOC1 - Manual of Construction with Steel Deck; 1992.

AN. SDI - Steel Door Institute:

1. ANSI/SDI 100 - Recommended Specifications Standard Steel Doors and Frames; 1991.
2. SDI 105 - Recommended Erection Instructions for Steel Frames; 1998.
3. SDI 107 - Hardware on Steel Doors (Reinforcement - Application); 1984.
4. SDI 125 - High Frequency Hinge Preparations for Frames; 1992.

AO. SJI - Steel Joist Institute:

1. SJI (SPEC) - Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders; 1994, Fortieth Edition.

AP. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association, Inc.:

1. SMACNA (ASMM) - Architectural Sheet Metal Manual; 1993.
2. SMACNA (DCS) - HVAC Duct Construction Standards; 1995, with Addendum No. 1.

AQ. SSPC - Society for Protective Coatings:

1. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 1982 (Ed. 2000).
2. SSPC-Paint 25.1 - Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel; 1997 (Ed. 2000).
3. SSPC-Paint 25.1BCS - Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Blast Cleaned Steel; 1997 (Ed. 2000).
4. SSPC-SP 1 - Solvent Cleaning; Society for Protective Coatings; 1982.
5. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1982 (Ed. 2000).
6. SSPC-SP 3 - Power Tool Cleaning; Society for Protective Coatings; 1982 (Ed. 2000).
7. SSPC-SP 5 - White Metal Blast Cleaning; Society for Protective Coatings; 2000.
8. SSPC-SP 6 - Commercial Blast Cleaning; Society for Protective Coatings; 2000.
9. SSPC-SP 7 - Brush Off Blast Cleaning; Society for Protective Coatings; 2000.
10. SSPC-SP 10 - Near White Blast Cleaning; Society for Protective Coatings; 2000.

AR. TCA - Tile Council of America:

1. TCA (HB) - Handbook for Ceramic Tile Installation; 2001.

AS. USGBC - U. S. Green Buildings Council, www.usgbc.org

1. USGBC (LEED) - LEED Building Rating System; current edition.

AT. WDMA - Window and Door Manufacturers Association (formerly National Wood Window and Door Association):

1. WDMA NWWDA I.S.1-A - Architectural Wood Flush Doors; 1997.
2. WDMA NWWDA I.S.6 - Wood Stile and Rail Doors; 1997.

PRIVATE EVALUATION ORGANIZATIONS

A. FM - Factory Mutual System:

1. FM P7825 - Approval Guide; current edition.

B. ITS - Intertek Testing Services (including Warnock-Hersey):

1. ITS (DIR) - Directory of Listed Products; current edition.
- C. NFRC - National Fenestration Rating Council
- D. UL - Underwriters Laboratories Inc.:
1. UL (BMD) - Building Materials Directory; current edition.
 2. UL (EAUED) - Electrical Appliance and Utilization Equipment Directory; current edition.
 3. UL (ECMD) - Electrical Construction Materials Directory; current edition.
 4. UL (FPED) - Fire Protection Equipment Directory; current edition.
 5. UL (FRD) - Fire Resistance Directory; current edition.
 6. UL (RMSD) - Roofing Materials and Systems Directory; current edition.
 7. ANSI/UL 972 - Burglary Resisting Glazing Material; 1995.

END OF CHAPTER 00840

CHAPTER C2

INTERIOR FIXTURES

PERFORMANCE

A. Basic Function:

1. Provide elements fixed to interior construction that are necessary for complete and proper functioning of spaces required by the program.
2. Interior fixtures are functional items that are permanently attached to interior walls, ceilings, and floors, except for equipment items and items that are integral components of service systems, and comprise the following elements:
 - a. Identifying Devices: Informational accessories, including room numbers, signage, and directories.
3. Where interior fixtures are integral with elements defined within another element group, meet requirements of both element groups.
4. In addition to the requirements of this chapter, comply with all applicable requirements of Chapter 111 - Facility Performance and Chapter C - Interiors.

B. Amenity and Comfort:

1. Deleted (am#5).
 - a.
2. Light and Glare: Provide interior fixtures that are not a source of direct or reflected glare.
 - a. Written and Graphic Information on Interior Fixtures: Clearly legible from typical viewing distances by occupants with normal eyesight.
 - b. Surfaces Containing Written or Graphic Information: Matte finished to reduce the incidence of veiling reflections.
 - c. Trans-Illuminated Surfaces: Luminance that is not more than 10 times brighter than surrounding surfaces under ambient lighting conditions for the space.
3. Convenience: Provide interior fixtures with fittings and controls that are manageable without special instruction or the need for excessive force.
4. Texture: Provide durable, low maintenance exposed surfaces for interior fixtures that are within reach of occupants engaged in activities normal for the particular space in which they are installed.

C. Health and Safety:

1. Flammability: Provide interior fixtures made of materials with flame spread index of 25 or less and smoke developed index of 450 or less when tested in accordance with ASTM E 84-2000a at all locations throughout the project.

D. Operation and Maintenance:

1. Ease of Use:
 - a. Language of Identifying Devices: All text in English.
 - b. Interior Fixtures with Movable Components: Easy to use without special instruction and designed to prevent misuse.
 - c. Hinges and Latches: Medium weight hardware, easily adjustable, providing minimum anticipated service life of 20 years.
2. Ease of Repair: Provide interior fixtures at all locations that are designed to permit repair or replacement of individual components without removal of fixture.

3. Ease of Replacement or Relocation: Provide interior fixtures at all locations that are modular in form, detachable from substrate without damage to fixtures, and relocatable.

PRODUCTS

A. Window Treatments:

1. Use the following:
 - a. Window blinds throughout the project.

END OF CHAPTER C2

CHAPTER C21

IDENTIFYING DEVICES

PERFORMANCE

A. Basic Function:

1. Provide identifying devices fixed to interior construction that are necessary for direction to and identification of functions and spaces as required by the program.
 - a. Room Label Signs: Provide room label signs for all primary spaces.
2. Identifying devices comprise the following elements:
 - a. Room or function labels applied to doors or walls immediately adjacent to doorways.
3. Text/Content of Identifying Devices: Some content will be provided by Government; remainder to be provided by Contractor for Government's approval.
4. Where identifying devices are integral with elements defined within another element group, meet requirements of both element groups.
5. In addition to the requirements of this chapter, comply with all applicable requirements of Chapter 111 - Facility Performance, Chapter C - Interiors, and Chapter C2 - Interior Fixtures.

B. Amenity and Comfort:

1. Deleted (am#5).
2. Visibility:
 - a. Character Size: Provide signs with characters of adequate size to be seen comfortably by normally sighted persons at typical viewing distances.
 - b. Contrast: Provide signs with contrast between characters and background of not less than 70 percent.
3. Convenience:
 - a. Room Label Signs: Provide signs with feature allowing Government to change information.
4. Appearance:
 - a. Provide signage for entire project that is consistent in design with other interior features and coordinated with overall color scheme.

C. Operation and Maintenance:

1. Ease of Replacement: For building directories, provide system with message strips that are easily replaceable by Government's personnel.

PRODUCTS

END OF CHAPTER C21

CHAPTER C23

WINDOW TREATMENT

PERFORMANCE

A. Basic Function:

1. Provide window treatments attached to interior construction that are necessary for adequate control of light, glare, privacy, and views for spaces with exterior windows.
2. Where window treatments are integral with elements defined within another element group, meet requirements of both element groups.
3. In addition to the requirements of this chapter, comply with all applicable requirements of Chapter 111 - Facility Performance, Chapter C - Interiors, and Chapter C2 - Interior Fixtures.

B. Amenity and Comfort:

1. Thermal Comfort: Provide window treatment throughout project that enhances interior thermal comfort.
2. Deleted (am#5)
3. Convenience: Provide window treatment throughout project with controls that are conveniently located and easily operated.
4. Appearance: Provide window treatment throughout project that is coordinated with window modules and does not conflict with expression of architectural elements of interior construction.

C. Durability:

1. Colorfastness: Provide window treatment throughout project that is resistant to degradation from exposure to ultraviolet light.

PRODUCTS

A. Window Blinds:

1. Do not use:
 - a. Horizontal wood mini-blinds.
 - b. Horizontal wood blinds.
 - c. Vertical aluminum blinds.
 - d. Vertical PVC blinds.
 - e. Vertical fabric blinds.

END OF CHAPTER C23

CHAPTER D3

HVAC - HEATING, VENTILATING, AND AIR CONDITIONING

PERFORMANCE

A. Basic Function:

1. Provide artificial means of controlling temperature, relative humidity, velocity, and direction of air motion in the interior spaces enclosed by the shell, and reduction of airborne odors, particulates, and contaminant gases.
2. The HVAC system consists of the following elements:
 - a. Energy Supply (D31): Elements which provide energy used to maintain building comfort.
 - b. Heat Generation (D32): Elements required to heat building to maintain space comfort.
 - c. Refrigeration (D33): Elements necessary to generate the cooling required to maintain building comfort.
 - d. Air Distribution (D34): Elements required to distribute air to maintain building comfort.
 - e. HVAC Controls (D36): Elements required to control equipment which maintains building comfort.
 - f. Emergency air handler unit shut off switch accessible by occupants, condenser 10 Feet from building.
3. Where HVAC elements also must function as elements defined within another element group, meet the requirements of both element groups.
4. In addition to the requirements of this chapter, comply with all applicable requirements of Chapter 111 - Facility Performance and Chapter D - Services.

B. Amenity and Comfort:

1. Space Temperature Setpoint: As specified in Chapter 111.

C. Health and Safety:

1. Outdoor Air Intakes: Locate all outside air intakes minimum of 3m (10ft) above grade (AM#5).
2. Locate exterior HVAC equipment 10m (33ft) from exterior wall of building (AM#5).
3. **Standard Equipment Bracing: Design all overhead equipment mountings to resist forces of 0.5 times the equipment weight in any direction and 1.5 times the equipment weight in the downward direction. This standard does not preclude the need to design equipment mountings for forces required by other criteria such as seismic standards.**
(AM#1)
4. Electrical Shock Prevention:
 - a. Provide a means of disconnecting power at each piece of equipment.
5. Refrigerants:
 - a. Comply with the requirements of ASHRAE 15-1994.
 - b. Prevent release of refrigerant to atmosphere.
 - c. Prevent exposure of occupants to hazardous refrigerants.
6. Indoor Air Quality: Provide sufficient ventilation to obtain acceptable indoor quality, determined using the Ventilation Rate Procedure of ANSI/ASHRAE 62-1999 .

D. Operation and Maintenance:

PRODUCTS

A. HVAC System Type:

1. Use one or more of the following:
 - a. Stand-Alone HVAC Systems:
 - 1) Forced-draft, natural gas furnace with split-system cooling.
 - 2) Air-cooled, self-contained air handlers.
 - 3) Gas Fired, vented, high intensity radiant tube heaters. (Repair Bays, Warehouse).
 - 4) Gas Fired Unit heaters (Utility and POL).
 - 5) Gas fired heating-ventilating and make-up air units (**Welding Bay** (AM#1)).
 - 6) Exhaust Fans (Maintenance Pit, Repair Bays, Warehouse, Toilets).
 - 7) Supply Fans (Utility)
 - 8) Welding Exhaust System.
 - 9) Overhead Vehicle Tailpipe Exhaust System.(Repair Bays)
 - 10) Condenser Unit.
 - 11) Gas Fired Domestic Water Heater.
 - b. Central HVAC Systems:
 - 1) Central chilled water and hot water heating systems with fan coil units and air handlers.
 - 2) Chilled water supplied by an air-cooled chiller.

END OF CHAPTER D3

CHAPTER D36

HVAC CONTROLS

PERFORMANCE

A. Basic Function:

1. Provide the elements necessary to control the building's indoor environment.
 - a. Provide a programmable thermostat for each single zone unit to maintain the required space conditions and local, packaged control for each major piece of HVAC equipment.
 - b. Provide a building control system which controls the indoor environment, manages energy consumption, schedules preventative maintenance, controls interior lighting, controls exterior lighting, integrates fire alarm and security functions, monitors fuel consumption, monitors water usage, and monitors packaged equipment controls.
 - 1) Provide monitoring of major pieces of HVAC equipment.
 - 2) Monitor the following equipment:
 - a) Air handlers.
 - (1) On-off status.
 - (2) Entering air temperature.
 - (3) Leaving air temperature.
 - (4) Filter status (clean/dirty).
 - b) Chillers.
 - (1) On-off status.
 - (2) Entering chilled water temperature.
 - (3) Leaving chilled water temperature.
 - (4) Safety controls.
 - c) Packaged terminal air-conditioning units.
 - d) Unit ventilators.
 - e) Furnace: On-off status.
 - f) Pumps: On-off status.
 - 3) Control the following equipment:
 - a) Air handlers.
 - (1) Start-stop.
 - b) Chillers.
 - (1) Start-stop.
 - c) Packaged terminal air-conditioning units: Start-stop.
 - d) Furnace: Start-stop.
 - e) Pumps: Start-stop.
 - f) Gas Fired Unit Heaters: Start - stop.
 - g) Gas Fired Infrared Heaters: Start - stop
2. Where control and instrumentation elements also must function as elements defined within another element group, meet the requirements of both element groups.
3. **Meters: Provide electric, gas and water meters with pulse initiators. Supply conduits with conductors from each meter to a terminal cabinet in the main mechanical room for future connection. (Am#3)**
4. In addition to the requirements of this chapter, comply with all applicable requirements of Chapter 111 - Facility Performance, Chapter D - Services, and Chapter D3 - HVAC.

B. Amenity and Comfort:

1. Zoning and Space Temperature Control:
 - a. Provide each computer room with a dedicated zone. Provide temperature control.

2. Building Control System: Provide a central location to monitor and control each zone setpoint.
- C. Health and Safety:
1. Life Safety: Provide interconnection and coordination of HVAC controls with other life safety systems.
 2. Fire Sources: Provide products which are rated for the specific locations where they are installed.
- D. Durability:
1. Expected Service Life Span: Provide a system which will last a minimum of 10 years in service without major repairs or operating expense.
 2. Vandalism: Protect the system field panels from unauthorized access. Emergency shutoff switch for AHU located to be easily accessible by building occupants.
 3. Accidental Damage: Protect thermostats from accidental damage.
- E. Operation and Maintenance:
1. System Capacity: Provide a building control system with sensors and points to perform as specified and add 50 percent more points.
 2. Ease of Use:
 - a. DDC electronic/ electric control system shall be LONWORKS compatible. The system network **must be Echelon LONWORKS based on Echelon's LNS network operating system.** All nodes shall communicate with each other over a twisted pair of wires, utilizing Echelon's free topology. **LonMaker for Windows** or Honeywell **WEBstation** must be used to design, commission, operate, and maintain the multi-vendor, open, interoperable **LONWORK** control network.
 - b. Locate field panels in electrical closets.
 - c. Locate the central controller in the maintenance office.
 - d. Provide a system which is user programmable.
 - e. Provide field panels which are independent and do not need the central controller to continue functioning.
 3. Ease of Service:
 - a. Provide a system of modular design.
 4. Energy Efficiency: Provide :
 - a. Holiday scheduling.
 - b. Night setback.
 - c. Outside air economizer.
 - d. Chiller staging (if more than one chiller).
 - e. Optimum start.
 - f. Optimum stop.
- F. **Commissioning:**
1. **1. Commissioning shall be accomplished for all mechanical systems (excluding bridge cranes) using specification 15995A, division 15, Volume 3 as a guide. Commissioning shall be executed by a third party firm regularly engaged in commissioning of similar mechanical systems, with a minumin of three years experience. (am#5)**

PRODUCTS

- A. Building Control System Types:
1. Use one or more of the following:

- a. Direct digital control (DDC) system compatible with LONWORKS.
- b. a programmable thermostat with a on board electronic control sequences of the unitary equipment

END OF CHAPTER D36

CHAPTER D43

FIRE DETECTION AND ALARM

PERFORMANCE

A. Basic Function:

1. Provide complete supervised addressable automatic fire detection and automatic alarm systems as required by code, also see attachment A, drawing A3.
2. Integrated systems performing all functions are required, subject to requirements of code for separated, independent systems.
3. deleted (Am#3).
4. deleted (Am#3).
5. deleted (Am#3).
6. Fire Alarm Control Panel shall contain a minimum of two (2) Signaling Line Circuits (SLC). SLC's shall be Class A, Style 7. (Am#5)
7. Notification Appliance Circuits (NAC) shall be Class A, Style Z. (Am#5)
8. A Looped Conduit System for all circuits and Fire Alarm Devices shall be provided so that a Conductor Break will not effect system operation. (Am#5)

B. Health and Safety:

1. Detection, Alarm, Notification Methods: In accordance with NFPA 72-1999 and Corps Guide Spec. No. 13851. (Am#5)
2. Detection:
 - a. Air Handling Units Over 3360 cu m/h (2,000 cfm): Minimum of one detector in supply.
 - b. Upon detection of fire or smoke condition, automatic notification of occupants, and Ft. Hood central fire station.
 - c. Provide a heat detector in the room, which houses the fire alarm control panel.
3. Alarms:
 - a. Manual stations at minimum of 45 m (150 feet) intervals along means of egress paths, and at all exterior doors.
 - b. Audible Alarms: Minimum of 15 dB over ambient noise, audible throughout common areas and means of egress.
 - c. Visual alarms, in locations required by code and public toilets and corridors.
4. Fire Protection Controls:
 - a. Provide connections between alarm and detection system and fire suppression system activation sensors.
 - b. Upon Alarm: Shut down or deactivate the following:
 - 1) HVAC air distribution.
 - 2) Fire-rated window shutters.
5. Audible and visual trouble notification of operations staff, for alarm zone failures, annunciator zone failures, ground faults, backup power failure, water supply equipment failures.
6. Hard wired electrical supervision of all components required by MIL-HNDK-1008C and all tamper switches on post indicator valves. Trouble or alarm signals shall be sent to the Central fire station.
7. Error and Failure Prevention: Addressable system; "tamper" sensors at sensitive points;

products of only one manufacturer or certified by manufacturer as compatible.

8. deleted (Am#3).
9. **Fire Alarm Contractor shall be Licensed by Texas State Fire Marshall's Office. (Am#5)**

C. Operation and Maintenance:

1. Power Supplies:
 - a. Building power for all systems.
 - b. **Dedicated Battery Backup Power with Battery Charger: (Am#5)**
 - 1) Fire safety systems, 72 hours.
 - 2) Emergency communications, 48 hours.
2. Ease of Use:
 - a. One centralized monitoring display (control panel) for all systems located in mechanical room and one remote annunciator panel located in a general office area.
3. Government Personnel Training: As specified in Chapter 00830.
 - a. Operational: Minimum of 8 hours, for each separate system.
 - b. Maintenance: Minimum of 8 hours, for each separate system.

PRODUCTS

A. Control Systems for All Applications:

1. **Use the following: (Am#3)**
 - a. Microprocessor-based hardware.

B. Fire/Smoke Detectors:

1. **Use the following: (Am#3)**
 - a. Photoelectric smoke detectors.
 - b. Fixed temperature heat detectors.

C. Warning Devices:

1. **Use the following: (Am#3)**
 - a. Horns.
 - b. Speakers.
 - c. Combination speaker /strobes.

D. Communication Cabling:

1. **Use the following: (Am#3)**
 - a. **Copper cable, Approved by Fire Alarm Panel Manufacturer. (Am#5)**

E. Manual Pull Station:

1. **1. Red, Double-Action Type, with Key (CAT 15) Reset and Addressible Unit from Manufacturer. (Am#5)**

F. **FACP: Rec, "Notifier" or Equal Panel. (Am#5)**

G. **LED Graphic Annunciator at Front Entrance with Architectural Plan of Bldg. (Am#5)**

H. **All Tamper and Flow switches shall be Addressible with Monitor Modules. (Am#5)**

I. **Provide Radio Alarm Transmitter for each FACP that is Compatible with Post Monaco D700 Base Station. Transmitter shall be complete with Antenna, Backup Battery Power, and set at Post Frequency. (Am#5)**

END OF CHAPTER D43

CHAPTER E19

OTHER EQUIPMENT

PERFORMANCE

A. Basic Function:

1. Other equipment comprises the following elements:
 - a. Parts or item wash equipment, including one "Hotsy" type packaged hot water wash unit for parts washing in scheduled maintenance bay. **(Am#3)**
 - b. **(am#1)** Vehicular service equipment, including used oil collection, used antifreeze collection, off-spec fuel collection, engine oil (50 wt.) dispensing, antifreeze dispensing, gear lube oil dispensing, transmission fluid dispensing, chassis lube (grease) dispensing, .
 - c. Vehicle exhaust collection equipment, including high temperature flexible exhaust hoses with vehicle adapters and hose reels.
 - d. Compact Item Repair Shop and General Item Repair Shop adjustable local exhaust nozzles.
 - e. Welding shop downflow benches and spring balanced adjustable flex hose local exhaust nozzles.
 - f. Brake shop downflow work bench with HEPA filtration.

B. Amenity and Comfort:

1. Parts/Vehicle wash unit: Provide stationary unit affixed to slab. Provide electric motor, belt drive, positive displacement pump. Provide trigger actuated hand held nozzle with hose. Provide a wall mounted adjustable timer for automatic unit shutdown. Minimum capacity shall be 0.19 L/s at a discharge pressure of 8270 kPa. Provide a gas fired water heating section for the item wash unit. Provide adjustable pattern spray tips or assorted pattern spray tips for each unit.
2. **(am#1)** Vehicular service equipment: Overhead hose reel shall be provided between each two scheduled maintenance bays for engine oil, antifreeze coolant, chassis grease, transmission fluid, and gear lube oil dispensing. Each dispensing hose for liquids shall be provided with dispensing meter. In addition, regulated compressed air station with duplex quick connectors and domestic water hose bibs shall be available at each column between shop service bays. Chassis lube and compressed air hose, reel, and dispensing regulator shall be provided in each service and inspection pit. used oil and used antifreeze receptors shall be provided at columns between each two service bays. The waste from the receptors shall be collected by a piped collection system and pumped to exterior used oil and used antifreeze storage tanks. Any collection piping located below grade shall be in double wall containment piping with leak detection system. Two rolling or slide out catch basins shall be provided in the service pit for collection of used oil and used antifreeze. These catch basins shall, through a flexible hose and diaphragm pump, transfer the received waste fluid to the appropriate storage tank. The used oil and used antifreeze tanks shall each be 1000 gallon capacity, double wall, concrete encased, above ground storage tanks. An off-spec fuel storage tank similar to the used oil tank shall also be provided. The contractor shall develop a method of receiving off-spec fuel from a catch pan and transfer it to the storage tank. **The designer is required to provide a laminated card with step-by-step operating procedures required for system start up, operation and shutdown located near the pump control valve or switch.** **(am#1)**
3. Vehicle exhaust collection equipment: Hose reel shall be electric motor operated.
4. Compact Item Repair & General Item Repair Shops shall each be provided with a spring balanced, flexible hose, local exhaust with flanged nozzle. The exhaust shall be wall mounted and shall have a 10 ft. radius of reach. Exhaust cfm shall be adequate to produce 100 fpm capture velocity at 6 to 9 inches from the nozzle. The exhaust fan shall be remotely located to minimize noise but shall be easily accessible for maintenance. Local exhaust shall be manually switched. Exhaust discharge shall be to the exterior of the building.

5. Welding shop downflow benches and local exhaust nozzles. Provide (4) four 2.3' x 3' downflow welding benches. Provide (4) four spring balanced, adjustable position, flex hose, local exhaust nozzles with flanged nozzles. Downflow benches and local exhaust nozzles shall be manifolded to a single exhaust fan. discharge shall be to the exterior of the building. Flowrate of benches shall be 200 cfm/sf of benchtop area. Flowrate of local exhaust nozzles shall be 1000 cfm each.
6. Brake (am#5) downflow work bench shall be 5' x 3' with slotted or perforated, heavy duty steel work surface. The bench shall have a fixed rear shield and removable side shields to aid air flow and particulate capture. The work surface shall support a minimum concentrated load of 500 lbs and a minimum distributed load of 1200 lbs. The bench shall have an integral or separate exhaust fan and HEPA filtration section as well as integral cleanout doors and internal dust trays. The bench exhaust shall be discharged to the exterior of the building. Flowrate of the bench shall be 200 cfm/sf of benchtop area.

C. Health and Safety:

1. **Deleted by am#1.**
2. Vehicle service equipment:
3. Ventilation equipment shall be designed in accordance with ACGIH Industrial Ventilation manual of recommended practice.

PRODUCTS

- A. Construct using equipment and materials specified in section 15487, Vehicle Maintenance Equipment, located in volume IV.

METHODS OF CONSTRUCTION

- A. Construct using the methods specified in section 15487, Vehicle Maintenance Equipment, located in volume IV.

END OF CHAPTER E19

SECTION 01016

DESIGN DOCUMENT REQUIREMENTS

09/2001

AMENDMENT NO. 0005

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI SP-66 (1994) ACI Detailing Manual

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 (2000) Structural Welding Code - Steel

INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (ICBO)

ICBO Bldg Code (1997) Uniform Building Code (3 Vol.)

MILITARY HANDBOOKS (MIL HDBK)

MIL HDBK 1008C (10 June 1997) Fire Protection For
Facilities Engineering, Design and
Construction

US ARMY CORPS OF ENGINEERS, SOUTHWESTERN DIVISION (SWD)

SWD-AEIM (October, 2000) Architectural and
Engineering Instructions Manual (SWD-AEIM)

1.2 RELATED SECTIONS

00570 CONTRACT DEFINITIONS
00830 DESIGN AND CONSTRUCTION PROCEDURES
00840 REFERENCED DOCUMENTS

1.3 SUBMITTALS

SD-05 Design Data

Design Data Checklists; .

Include the Fire Protection, Code Analysis, (Am#5)
(Attachments A, B, and C) at the end of this Section with the Design
Analysis and submit with the design submittals.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 DRAWINGS

Prepare, organize, and present drawings in the format specified. Provide drawings complete, accurate, and explicit enough to show compliance with the Contract requirements and to permit construction. The layout of individual sheets and the organization of the assembled set shall follow and communicate a logical sequence. General information shall be presented first, progressing to more detailed information. When assembling details, begin in the upper left-hand corner of the sheet with letters progressing to the right and down. Drawings illustrating systems proposed to meet the requirements of the Contract performance specifications shall reflect proper detailing for each such system to assure appropriate use, proper fit, compatibility of components, and coordination with the design analysis and specifications required by this section. Coordinate drawings to ensure there are no conflicts between design disciplines and between drawings and specifications. For specific drawing requirements, see paragraphs: DESIGN DEVELOPMENT (60 PERCENT PRELIMINARY DESIGN) REQUIREMENTS and CONSTRUCTION DOCUMENTS (100 PERCENT DESIGN) REQUIREMENTS.

The following subparagraphs cover general drawing requirements and supplement those specified in SWD-AEIM, Chapter VIII DRAWINGS.

3.1.1 CADD Drawings

The Contractor shall ensure that all delivered CADD digital files and data (e.g., base files, reference files, cell/block libraries) are compatible with the Government's target CADD system and operating system, which is Bentley Systems MicroStation, version SE or J, running on Microsoft Windows 95/NT or 2000, and adhere to the standards and requirements specified. The term "compatible" means that data is in native digital format i.e. .dgn, and can be accessed directly by the target CADD system without translation, preprocessing, or postprocessing of the digital data files. It is the responsibility of the Contractor to ensure this level of compatibility.

3.1.2 CADD Standards

CADD drawings shall be prepared in accordance with the applicable general and discipline-specific provisions for drawing formats, level/layer assignments, line colors, line weights, and line types of the "Tri-Service A/E/C Standards" and the "SWD Architectural and Engineering Instruction Manual (AEIM), Chapter VIII, "Drafting Standards."

The CADD standards for design of this project, including seed/prototype files containing the Government's preset standard settings and electronic reference files containing the Government's standard border/title block sheets, are located at the following Web site:

<http://tsc.wes.army.mil/products/standards/aec/aecstdweb.asp>.

The Contractor shall submit a written request for approval of any deviations from the Government's established CADD standards. No deviations will be permitted unless prior written approval of such deviation has been received from the Government.

3.1.3 Size of CADD Drawings

Overall Size of CADD drawings shall be SI AI (594 mm by 841 mm (23.39 by

33.11 inches)), at the trim line. Full size drawings shall be submitted for all design submittals. SI working units and the District's standard file-naming convention shall be used. See Section 01015 DESIGN REQUIREMENTS AFTER AWARD for the Metric/English option.

3.1.4 .CAL Files

In addition to copying the electronic CADD drawing files to the Submittals' CD-ROM disk, include the drawings in .cal format so that the drawings may be viewed on screen using MaxView Reader that is located on the Solicitation and Contract CD-ROM disks. Include a "sendable" compiled Project.svd index file, created with MaxView Author, so that the drawings may be viewed by double-clicking on this file. MaxView's web site is <http://www.maxview.com>. Keep the CADD files and the .cal files in separate folders.

3.1.5 Drawing Format

Title block shall include, as a minimum, project title and location, sheet title, and sequence number. For each design submittal, each Contractor-prepared drawing shall bear the printed name and signature of the registered architect or appropriate registered engineer responsible for the work portrayed on that drawing and proposed to meet the Contract requirements. For the final submittal, each Contractor-prepared drawing shall bear the stamp or seal and signature of the registered architect or appropriate registered engineer responsible for the work portrayed on that drawing and proposed to meet the Contract requirements.

3.1.6 Drawings Sequence

Arrange drawings by design discipline in accordance with the SWD-AEIM, Chapter VIII, Appendix A, Plate D1, Standard Arrangement Of Drawings.

3.1.7 Drawings Required

As a minimum, the construction drawings shall consist of the following:

- a. Cover or Title Sheet
- b. Index of Drawings (each technical discipline shall have a separate drawing legend sheet located in front of each respective section), Legend, and Abbreviations
- c. Civil/Site Drawings, including Utility Drawings (Water Supply, Wastewater, Gas, Electrical, Fiber and Communication)
- d. Soil Boring Locations and Logs of Borings
- e. Turfing and Landscaping Drawings,
- f. Architectural Drawings
- e. Interior Design Drawings
- g. Structural Drawings
- h. Mechanical Drawings

- i. Fire Protection Drawings
- j. Electrical Drawings (including communications, security and fire alarm)
- k. Lightning Protection
- l. Environmental Drawings
- m. Schedules - e.g. Doors, Windows, Interior Finishes, Equipment

3.1.8 Drawing Scales

Work shall be drawn at the scales listed below. All disciplines should use the same scale for plan sheets. Scale for all drawings and delineation will permit complete legibility. A graphic bar or checkerboard scale will be provided on each sheet near the lower left hand corner of the sheet. Unless specified elsewhere, conventional scale standards are as follows:

	METRIC (SI) (ENGLISH)
Site Plans (Buildings)	No smaller than 1:400 (No smaller than 1-inch = 30 feet)
Floor Plans (Note 1)	1:50 to 1:100 (1/4-inch to 1/8-inch = 1 foot)
Roof Plans	1:100 (1/8-inch = 1 foot)
Exterior Elevations	1:100 (1/8-inch = 1 foot)
Interior Elevations	1:50 (1/4-inch)
Cross Sections	1:50 to 1:100 (1/4-inch to 1/8-inch)
Wall Sections (Note 3)	1:20 (3/4-inch = 1 foot)
Stair Details	1:20 (3/4-inch = 1 foot)
Details (Note 2)	1:5 or 1:10 (3 inches or 1 1/2 inches = 1 foot)
Reflected Ceiling Plans	1:100 (1/8-inch = 1 foot)
Interior Toilet Elevations	1:20 (3/4-inch = 1 foot)
Wall Types	1:5 or 1:10 (3 inches or 1 1/2 inches = 1 foot)

Notes:

1. Scale of composite plans shall be as required so that the entire facility is drawn on one sheet without break lines.

2. The details shall be large enough to show all fixtures, accessories, equipment, materials, manner of construction, clearances required for proper maintenance, and complete dimensions. Toilet rooms and Equipment rooms are examples of the kind of spaces which shall be drawn as a Detail Plan. All details containing sheet metal flashing shall be 1:5 (3 inches = 1 foot).

3. May be 1:20 if pertinent details are shown at larger scale.

3.1.9 North Arrows

North arrows shall be oriented the same direction on all plan sheets and by all disciplines, including site and civil drawings. Plan north shall be "up" or to the left on the drawings. Indicate true north on composite plan drawings.

3.1.10 Legends and Symbols

Standard material symbols used on the drawings shall be provided as a separate legend drawing located just in front of the drawings in the set. Add additional material symbols to the Legend Sheet as needed for the project.

The standard symbols used for amendments (a triangular box) or contract modifications (a type of circular box, see the chapter on Drafting Criteria) shall not be used for any other purpose, and care must be taken to avoid using similar appearing but technically different symbols.

3.1.11 Key Plans

Provide key plans whenever the site or floor plan occupies more than one sheet of drawings. Locate the Key Plans at a uniform location on all site and floor and roof plan sheets to show the interrelationship between the building portions. Orient key plans in the same direction as the floor plan on all plan type drawings of all disciplines. All key plans shall be the same size and same location on the drawings.

3.1.12 Building Composite Plans

When required because of size of the building footprint, provide composite floor plans for the architectural, structural, mechanical, fire protection, life safety, and electrical disciplines. Include match lines for combining individual portions of floor plans. For mechanical plans, provide composite plumbing and heating, air conditioning, and ventilation (HVAC) plans showing plumbing and HVAC systems for each level. For plumbing composite sheets, building outline and pertinent HVAC equipment shall be half-toned with plumbing system at standard lineweight. For HVAC composite sheets, building outline and pertinent plumbing equipment shall be half-toned with HVAC equipment at standard lineweight. Do not provide construction notes on these plans. Include a key plan and room schedule legend on the composite plan sheets.

3.1.13 Schedules

Schedules shall be clear and complete. Furnish as many columns as necessary to present the essential information. Do not use the "Remarks" column as a substitute for an information column. Normally a single item shall be presented on each schedule line. Other scheduling methods as standard with the Architect-Engineer may be used if approved by written authorization from the Contracting Officer.

3.1.14 Notes

Notes may be placed on drawings to reduce the amount of repetitive drafting, provided that clarity is not lost. General notes should be placed at the right-hand edge of the sheet and, if possible, should be located on the first sheet in the set. Notes that pertain to each drawing should be placed on each drawing. Keyed notes are permitted. General notes may be provided on a separate sheet if space does not exist on the Abbreviation and Legend sheets.

3.1.15 Dimensions

Dimensions shall be complete, accurate, and fully coordinated. Use

slashes, not arrowheads or dots. Dimensions should be to points easily measurable in the construction, and shall be laid so as not to eliminate refiguring in the field. Dimensions should be tied-in to column lines, etc., to facilitate checking. Plan dimensions for frame construction should be to face of stud (or sheathing) for exterior walls, to one face of stud for interior partitions, and to centerline of openings. For masonry construction, dimensions shall be to one or both nominal faces of masonry and to jambs of openings.

a. Horizontal dimensions shall occur on the plans and vertical dimensions on sections and elevations.

3.1.16 Standard Drawings

Standard Drawings, when furnished for site adaptation, will generally be utilized without basic architectural change. Portions of the drawings not pertinent to the project will be deleted. Specific instructions will be given when design changes are required.

3.1.17 Sketches

All sketches presented during the design phase shall be reduced to 216 mm by 280 mm (8-1/2" by 11") and included in the design analysis to document the design options and decisions evaluated during the design process.

3.2 CONSTRUCTION SPECIFICATIONS

3.2.1 Editing Construction Specifications

The Contractor shall use Corps of Engineers' UFGS Guide Specifications. Specification paragraphs and subparagraphs shall not be rewritten to lessen the quality of the original guide specification sections. Only bracketed choices and inapplicable items may be deleted unless the changes are required to bring the specification into conformance with the performance specifications of the Contract. The Contractor shall complete the editing of all options in these specifications. Where designer notes are provided, the Contractor shall edit the choice in accordance with the recommendations and guidance of the Notes. **The specifications shall clearly identify, where appropriate, the specific products chosen to meet the requirements of the Contract (manufacturers' brand names and model numbers or similar product information). The Contractor shall be responsible for coordinating references, along with the Contract performance requirements, to specific specification sections (number and title) within the construction specifications.** See additional requirements in paragraphs DESIGN DEVELOPMENT (60 PERCENT DESIGN REQUIREMENTS) and CONSTRUCTION DRAWINGS (100 PERCENT DESIGN) REQUIREMENTS of this Section and in Section 01015 DESIGN REQUIREMENTS AFTER AWARD, paragraph DESIGN DOCUMENTS.

3.2.1.1 Required Modifications to Commercial Guide Specifications

- a. Indicate the guide specification series (e.g. CSI SpecText, MasterSpec, SpecLink) in either the header or footer of each section.
- b. Change references to the "Architect" or "Engineer" to "Contracting Officer" and "Owner" to "Government".
- c. Change references to "Section 01300" or "Section 01300 SUBMITTALS" to "Section 01330 CONSTRUCTION SUBMITTAL PROCEDURES."

3.2.1.2 Additions

If the Construction Specifications do not cover a feature that is in the project, insert additional requirements in their proper locations to adequately cover the feature of work. Additions shall not lessen the quality of materials indicated by the specifications. If a new material is added, it shall be properly referenced in "REFERENCES," "MANUFACTURERS," "MANUFACTURED UNITS," "MATERIALS," "SUBMITTALS," "TESTS," and "INSTALLATION" paragraphs, as applicable.

3.2.1.3 Deletion of Inapplicable Text Material

Delete all inapplicable text material to tailor the specifications to fit the project. After deletion has been made of all inapplicable paragraphs, subparagraphs, choices, and schedules from the body of the guide specifications (including but not limited to the correction of lists in "SUBMITTALS," "TESTS," and "INSTALLATION" paragraphs), delete all nonapplicable references listed in the preceding "REFERENCES" and "MATERIALS" paragraphs.

3.2.1.4 References to Specification Sections

The Contractor shall be responsible for coordinating references, along with the Contract requirements, to specific specification sections (number and title) within the project specifications. Revise section references (title and number) to reflect the titles and numbers of specification sections used.

3.2.1.5 Construction Submittals

The Contractor is responsible for all submittals. See Section 01330 CONSTRUCTION SUBMITTAL PROCEDURES for the definition of Government Approved and For Information Only (FIO) submittals. All submittals shall be "FIO" unless otherwise specified. Submittals noted in the UFGS guides as "G" shall be changed to "For Information Only".

3.2.2 Commercially Available Guide Specifications

For items of work not covered by the UFGS guide specifications, the Contractor may develop specifications utilizing commercially available construction guide specifications such as "SpecText" published by The Construction Specifications Institute and "MasterSpec" published by The American Institute of Architects. These must be converted to UFGS format to be compatible with the Corps of Engineers Resident Management System (RMS) and the Specsintact or BSD SpecLink (Building Systems Design, Inc., Atlanta, GA, <http://csi.worldweb.net/technic/master/bsdms.htm> and http://www.bsdsoftlink.com/speclink/sl_frame.htm). Do not use DBI/CSI PerSpecView to develop the construction specifications. The UFGS format is specified in the Specsintact ARMYSECT.tpl template. Commercially available guide specifications must be converted to the UFGS format in order to develop the submittal register. Use Wordspec to convert the sections to Specsintact SISGML to produce the sections' submittal registers. See paragraph "Required Modifications to Commercial Guide Specifications" concerning references to the "Architect/Engineer" and the "Owner". See Section 01015 DESIGN REQUIREMENTS AFTER AWARD, paragraph DESIGN DOCUMENTS for additional information.

3.2.3 Division 1 Sections

Include Division 1 specifications sections contained in this Contract as part of the project specifications without change.

3.2.4 Format For Construction Specifications

Submit the construction specifications, including cover page and project table of contents, printed using a word processor. Use the Corps of Engineers Specsintact with SGML, Version 3.0 or higher, software. DO NOT submit sections that were created as straight MSWord documents. Any MSWord sections must be created using MS Word For Windows software with the Specsintact WordSpec Macro installed and engaged. These Word documents must be formatted using the Specsintact menu bars that WordSpec installs on the MSWord desktop. Otherwise, Word documents will not be compatible with Specsintact and WordSpec will not be able to convert the sections to Specsintact for producing the submittal register. Use If any commercially available guide specifications are used and are from a relational database system such as BSD SpecLink, then export the sections to Rich Text Format (RTF) word processing files to convert the sections to MS Word documents for those users who are specified to receive MS Word copies of the specifications.

The Corps of Engineers Specsintact and Wordspec software can be downloaded from the Internet at the following address:

[http://kscdl2.ksc.nasa.gov/specsintact/.](http://kscdl2.ksc.nasa.gov/specsintact/)

The Corps of Engineers UFGS guide specifications (SI SGML format), the Lighting Fixture Standard Drawing 40-06-04 Details, and Design Criteria (e.g. Army Technical Manuals (TM's), Engineering Manuals, Engineering Technical Letters, Engineer Circulars, Engineer Pamphlets, Design Guides, and Military Handbooks) can be downloaded from the Internet at the following address:

[http://www.hnd.usace.army.mil/Techinfo/Engineer Publications or Support Documents](http://www.hnd.usace.army.mil/Techinfo/Engineer%20Publications%20or%20Support%20Documents)

The guides can only be downloaded in Winzip *.zip files. These are downloadable executable files.

Specsintact software, the UFGS guide specifications, and design criteria manuals can also be obtained from the current version of the Construction Criteria Base CD, issued by the National Institute of Building Sciences, telephone number 202/289-7800, fax number 202-289-1092, internet address is:

<http://www.nibs.org>.

Fort Worth District guide specifications and the District supplements to the UFGS guide specifications are located on the Internet at the following address:

<http://www.swf.usace.army.mil/links/e&c/ec-a/>

Print hard copies using laser printer and good quality white paper. For the design submittals, editing of the Construction Specifications shall be shown by using redlining (underlined text) for text insertions and strikeouts for text deletions. The corrected 100 percent specifications with review comments incorporated shall be cleaned up (markings for insertion and deletions removed) and submitted in both hard copy and on CD-ROM disk. Carbon copies are not acceptable.

3.2.4.1 Format

Format shall be the Construction Specification Institute (CSI) 16-Division, 3-Part Section format and match that used by the UFGS guide specifications.

Sections which are not in the UFGS and Fort Worth District guide specification series shall be numbered in accordance with CSI MasterFormat.

No two sections shall have the same section number.

3.2.4.2 Cover Page

The Cover page shall be similar to the Contract Cover page and shall include:

- a. Project title, activity and location
- b. Construction contract number
- c. Construction Contractor's name and address
- d. Design firm's name and address
- e. Names of design team members responsible for each Contractor prepared technical discipline of the project specification
- f. Name and signature of a Principal of the design firm
- g. The Table of Contents shall list the 16 Divisions contained in CSI format and the specification section numbers and titles contained in the project specification. Do not list in the Table of Contents CSI Divisions that are not required for the project.

3.2.5 Construction Submittals

All construction submittals shall be in accordance with Section 01330, "CONSTRUCTION SUBMITTAL PROCEDURES."

3.2.6 Submittal Register

An electronic version of the ENG Form 4288 is located on the Solicitation and Contract Award CD-ROM disks in folder "Subreg." This version is the Specsintact DOS Submittal Register program and includes a Readme.txt file. Copy the files to the computer's C:\ drive, remove the read-only attributes, and then double-click on either file "subreg.exe" or on "submit.bat." This is **not** a Windows-based program so the mouse **does not** work. Editing instructions are on-screen, such as press the "F5 (add)" and then the "E" keys to create new empty submittals, the "PgDn" key to complete editing, and the "A" key to accept. For each submittal, fill in the Section Number, Activity Number if applicable, Paragraph Number, Description, Type of Submittal (e.g. SD-01 through SD-11(See Section 01330 CONSTRUCTION SUBMITTAL PROCEDURES)), Classification (e.g. G or FIO), and the Contractor's proposed submittal date. Fill in columns "a" through "o"

on the ENG Form 4288 and submit a copy of the "Subreg" folder with the updated files and a hard copy of the register as required for the various design submittals. Unless Section 01330 CONSTRUCTION SUBMITTAL PROCEDURES allows a submittal to be Government approved ("G"), all submittals shall be "FIO" for Information Only (Contractor Approved) items. A blank MS Excel version of the Form 4288 Submittal Register is also included in the "Subreg" folder and may be used if allowed by the Contracting Officer.

3.3 DESIGN ANALYSES

Prepare design analyses (basis of design and calculations) for each design discipline. Specific requirements relative to the technical content to be provided are specified in the paragraphs 60 PERCENT PRELIMINARY DESIGN REQUIREMENTS and 100 PERCENT DESIGN REQUIREMENTS. The design analyses shall be a presentation of facts to demonstrate that the concept of the project is fully understood and that the design is based on sound engineering. The design analysis for each discipline shall be in accordance with Chapter IX of the SWD-AEIM.

3.4 COMMON DESIGN DEFICIENCIES

The work involved in making corrections due to common deficiencies becomes lost effort and time for both the designer and the reviewer. Carefully compare the design and contract documents with all requirements at several points in the design process to avoid unnecessary changes at a later date. Some of the requirements which are most often overlooked include:

a. Requirements of the COE 2, Southwestern Division's ARCHITECTURAL AND ENGINEERING INSTRUCTIONS MANUAL (SWD-AEIM) have been repeatedly overlooked in the past.

b. Failure to incorporate the Fort Worth District's supplemental local requirements to the UFGS guide specifications.

c. Not using correct abbreviations or terminology on the drawings. Abbreviations must match what is used on the standard abbreviation sheet and terminology must match what is used in the standard technical guide specifications.

d. Not using the correct scales, north arrow designation, section cut system, or incomplete dimensioning on the drawings.

e. Not providing sufficient space for door operation hardware at doors which swing into a wall running perpendicular to the opening. 100 mm minimum is required between edge of door frame and perpendicular walls.

f. Not providing correct and complete Design Analysis information written in the present tense. The Design Analysis will be written following the format indicated herein. A separate Fire Protection section in the Design Analysis with input from all disciplines is one area which is often overlooked and shall be included.

g. Not correctly presenting or coordinating (to avoid interference) features of Fire Protection, Noise Control, and Physical Security.

h. Not correctly referencing and cross referencing building sections, wall sections, details, etc.

i. Failure to read and use technical notes in editing the Guide Specifications.

j. Failure to coordinate all disciplines prior to submittal of projects for review.

k. Improper use of fire-retardant wood. Fire-retardant wood is combustible; its use in buildings that are of noncombustible construction is extremely limited (see UBC for the minor allowable uses). Because of the potential for severe degradation, fire retardant plywood shall not be used in a roof or roofing system, or in structural applications.

l. Incorrectly listing trade names in door hardware specifications in lieu of ANSI numbers and failure to correctly specify hardware finishes.

m. Control joints in CMU walls and brick expansion joints in face brick are not shown on both architectural plans, elevations and structural plans, or are inconsistent. Note also control joint locating and coordination for floor tile per Tile Council of America recommendations.

n. Failure to delete all publications which do not apply to the particular project.

o. North is not oriented the same direction on all sheets (civil, site, arch).

3.5 DESIGN CERTIFICATION

The Contractor shall provide certification for each design submittal in accordance with paragraph SUBMISSION OF CONSTRUCTION DRAWINGS, SPECIFICATIONS AND DESIGN ANALYSES, subparagraph "Certifications," of Section 01015 DESIGN REQUIREMENTS AFTER AWARD.

3.6 DESIGN DEVELOPMENT (60 PERCENT PRELIMINARY DESIGN) REQUIREMENTS

Preliminary design documents shall include all applicable plans, details, and specifications specified in the paragraph DESIGN DETAILS, drawn to 60 percent completion or more, unless otherwise indicated. Identify and resolve conflicts in the design requirements, between the design requirements and the Contractor's design proposal, or those due to lack of thorough understanding of the nature and scope of work prior to submittal of the 60 percent design. Drawings, design analysis, and specifications will be reviewed for compliance with the Contract design requirements at this design submittal. Submit the following:

3.6.1 Drawings

Furnish all drawings that are required for the 100 percent submittal. Except for site work, outside utilities, and building structural drawings, all drawings shall be developed to approximately 60 percent completion. Site work, outside utilities, and building structural drawings shall be 100 percent complete. The drawings shall be fully coordinated with the design analysis and specifications.

3.6.2 Specifications

Provide all specification sections required for 100 percent submittal. Specifications for site work, and utilities, and structural (Division 2 and those applicable in other Divisions shall be 100 percent complete. All other specifications required for the completion of the building, site work, utilities, and turfing shall be at least mark-ups of the required technical and trade sections. Include the identification of the "author"

of the industry guide specifications used, any mandatory guide specifications required in this Contract, and a project table of contents listing all sections to be included in the project.

3.6.4 Submittal Register

Prepare a Submittal Register as specified in Section 01330 CONSTRUCTION SUBMITTAL PROCEDURES and paragraph CONSTRUCTION SPECIFICATIONS, subparagraph "Submittal Register," of this Section. Submittals for site work, utilities, and building structure shall be 100 percent complete. Submittals for all other work shall be developed to the extent required to support the level of design included in this submittal. Submit a copy of the "Subreg" folder with the updated files and program and four hard copies of the register with this design submittal.

3.6.3 Design Analysis

The design analysis shall give the basis for design for all disciplines and should establish specific goals, objectives, and priorities for the design of this project. Identify, explain, and document use of design criteria and how the design meets goals, objectives, and priorities. The design analysis shall comply with SWD-AEIM, Chapter IX, and include narrative description and analysis of all building systems, appropriate checklists, calculations, and catalog cut sheets of equipment used in the design.

3.6.4 Sustainable Project Rating Tool (SPiRiT)

In accordance the substantiation requirements for Volume II DESIGN AND PERFORMANCE REQUIREMENTS, PERFORMANCE REQUIREMENTS Chapter 111 FACILITY PERFORMANCE, paragraph "Environmental Responsible Design," update the Contractor's Proposal's Sustainable Project Rating Tool (SPiRiT) sheets, indicating the status of design related to the listed elements to be achieved and any problems in achieving these elements.

3.6.5 Substantiation Requirements

See Volume II DESIGN AND PERFORMANCE REQUIREMENTS, PERFORMANCE REQUIREMENTS Chapters.

3.6.6 Commissioning Plan

See Section 00830 DESIGN AND CONSTRUCTION PROCEDURES, paragraph COMMISSIONING for requirements.

3.6.7 Demolition

Provide the site demolition drawings, 100 percent complete, ready to start abatement and demolition work.

3.6.8 Civil Design

The drawings shall be 100 percent complete, ready for start of construction. Drawings shall fully describe the type and the scope of work required. Include all necessary and required details, be thoroughly checked, and be fully coordinated with the Construction Specifications and all other Construction Documents.

3.6.9 Architectural Design

60 percent architectural drawing submittal shall be a complete set of architectural drawings without large scale details. All other drawings shall be complete except referencing of the large scale details. Room finish schedule, and door, window, and louver schedules, shall all be complete except for references to details.

3.6.10 Interior Design

Provide SID/CID Notebook(s) and design analysis..

3.6.11 Structural Design

Provide foundation plans and details which shall be 100 percent complete. Provide details and notes for required structural work. Building structural members shall be at least outlined. Provide elevation views, sections, and details necessary to illustrate the design at a 60 percent level of completion. Roof framing plan(s) shall show sufficient details to clearly indicate the type of framing system used, size, and spacing of members and their elevations.

3.6.12 Mechanical Design

Provide plans, piping diagrams, sections, flow diagrams, details, schedules, and control diagrams/sequences as necessary to define the required design intent at this level of design. Floor plans shall use the architectural floor plans as a basis, with the building outline half-toned. Unless otherwise indicated, all floor plans shall be drawn at a minimum 1:100 (1/8-inch = 1'-0") scale and shall show room names and numbers. Provide preliminary mechanical room sections to ensure that major equipment items, piping, and ductwork will fit as designed. For the 60 percent submittal, all supply and return mains shall be shown as double-lined although branch ducts, takeoffs, and ductwork to diffusers may be single-lined. Piping 152 mm and larger shall be shown as double-lined for the 60 percent submittals.

Complete Attachment C for mechanical room sizing.

3.6.13 Electrical Design

Fully coordinate the 60 percent design drawings with the design analysis. Provide sufficient plans, single-line diagrams, riser diagrams, details, and schedules as necessary to define the required design intent for this level of design. Indicate all circuits, circuit breakers or fuse locations, panelboards, and PDUs known at this level of design.

3.6.14 Fire Protection Design

Provide the Life Safety Plan and the Fire Protection site and floor plans, complete. Fire protection details shall be sufficient for this level of design.

3.6.15 Environmental Design

Provide drafts of the following items for the 60 percent submittal:

- a. Environmental Survey Sampling Plan (not in this CONTRACT)
- b. Basic Stormwater Pollution Prevention Plan (requirements in Section 01421)

c. Plans (a stand alone set of erosion and sediment control plans including vicinity and project site map, and detailed drawings for Storm Water Controls and Implementation of Pollution Prevention (ref. requirements in Section 01421)

d. Design Analysis: It shall address environmental issues and considerations for this contract and operation of the constructed facility. Also reference Sections 01410 Environmental Protection, 01421 OUTLINE OF A BASIC STORMWATER POLLUTION PREVENTIN PLAN (SWPPP), address the following issues (if applicable, and indicate NON-APPLICABLE), and provide necessary attachments, application forms and/or permit documents:

1.0 Cultural and Natural Resources.

1.1 National Environmental Policy Act (NEPA) Compliance. Document such as the Record of Environmental Consideration (REC) prepared by Fort Hood and the date of this document shall be address to indicate compliance of NEPA of 1969, as amended.

1.2 Protection of Historic Properties & Guidance

1.3 Protection of Cultural Properties & Guidance

1.4 Protection of Threatened and Endangered Species and Critical Habitats & Guidance

1.5 Protection of Wetlands, Floodplains & Guidance

2.0 Water Quality and Prevention of Water Pollution.

2.1 Water Supply & Guidance.

2.2 Municipal Wastewater & Guidance.

2.3 Industrial Wastewater & Guidance.

2.4 Storm Water & Guidance (also discuss design and construction documents to be prepared, see Section 01421).

3.0 Air Quality and Prevention of Air Pollution.

Design Issues & Guidance (discuss design festures and pre-construction document required)

4.0 Solid waste (Non-hazardous).

Design Issues and Guidance

5.0 Hazardous, Toxic and Radiological Materials.

Building demolition related materials.

5.1 Asbestos Containing Material (ACM).

5.2 Lead-Based Paint (LBP).

5.3 Other Regulated Materials.

5.4 Contaminated Sites.

5.5 Fuel or Fluid Storage Tanks.

6.0 Worker Protection Issues.

6.1 Construction

6.2 Facility Operation

7.0 Federal, State, and Local Permits, Notifications, and Registrations.

Type of documents, regulatory agencies, timeline for required document, fees responsibility, signature and approval coordination (see Section 01410)3.6.16 [Enter Appropriate

Subpart Title Here]

3.7 CONSTRUCTION DOCUMENTS (100 PERCENT DESIGN) REQUIREMENTS

All documents shall be 100 percent complete, ready for start of construction.

3.7.1 Drawings

The drawings shall be complete, ready for start of construction, and include all necessary and required details, be thoroughly checked, and fully coordinated with the construction specifications and all other Construction Documents. The final drawings shall include all the requirements and drawings defined for the 60 percent submittal plus any additional detail drawings required for complete 100% design. Drawing scale shall match architectural drawing requirements. Plans shall be legible at full-size. Previous comments and applicable criteria changes shall have been incorporated into the design.

3.7.2 Submittal Register

Prepare a complete a Submittal Register using ENG Form 4288 "Submittal Register" as specified in Section 01330 CONSTRUCTION SUBMITTAL PROCEDURES and paragraph CONSTRUCTION SPECIFICATIONS, subparagraph "Submittal Register," of this Section, listing submittals for all specification sections that require submittals. Submit four hard copies and on a CD-ROM disk the updated submittal register files and program for this design submittal and the final submittal.

3.7.3 Specifications

The construction specifications shall be complete, ready for start of construction, fully coordinated with the drawings and design analysis, and include all work. Specifications shall be in final form for construction and include all changes requested during the 60 percent review stage.

3.7.4 Design Analysis

The Design Analysis shall include the basic information presented in the previous submittal, corrected to reflect changes in content made in response to review comments. Outline specifications shall be omitted from the Final Design Analysis as the information is included on the final drawings and construction specifications. The design analysis shall be written in the present tense and will comply with SWD-AEIM, Chapter IX.

3.7.5 Sustainable Project Rating Tool (SPiRiT)

In accordance the substantiation requirements for Volume II DESIGN AND PERFORMANCE REQUIREMENTS, PERFORMANCE REQUIREMENTS Chapter 111 FACILITY PERFORMANCE, paragraph "Environmental Responsible Design," update the Contractor's Sustainable Project Rating Tool (SPiRiT) sheets, indicating the status of design related to the listed elements and the achievement level of the various goals listed in Volume II DESIGN AND PERFORMANCE REQUIREMENTS, PERFORMANCE REQUIREMENTS Chapter 111 FACILITY PERFORMANCE, paragraph "Environmental Responsible Design." Provide certification of achievement of the specified rating.

3.7.6 Substantiation Requirements

See Volume II DESIGN AND PERFORMANCE REQUIREMENTS, PERFORMANCE REQUIREMENTS Chapters.

3.7.7 Interior Design

Update the drawings, building related interior design (SID), Comprehensive Interior Design (CID), and the SID/CID Notebooks as required as a result of the 60 percent review.

3.7.8 Mechanical Design

All ductwork shall be double-lined. Piping 6 inches and larger shall be shown as double-lined.

3.7.9 Commissioning Plan

See Section 00830 DESIGN AND CONSTRUCTION PROCEDURES, paragraph COMMISSIONING for requirements.

3.8 DESIGN DETAILS

Drawings shall include the applicable plans, details, and requirements specified in the SWD-AEIM and those specified below.

3.8.1 Demolition

Show new work and demolition work on separate drawings. The type and the scope of removal work intended shall be clear from an inspection of the documents. Keyed notes for removal will be allowed.

a. Site Demolition Drawings (Removal Plan)

The removal plan shall show the existing physical features and condition of the site before construction. Include the field survey to show all above and below ground utilities; buildings, drives, roads and parking areas, walks, and vegetation; and such facilities as retaining walls, underground storage tanks, foundations, and existing contours. Physical features shall be indicated and noted: to be removed, to remain, or to be relocated.

3.8.2 Civil Design

The drawings shall be complete, fully describing the type and the scope of work required. Include all necessary and required details, thoroughly checked, and fully coordinated with the Construction Specifications and all other Construction Documents. Include the following as applicable:

- Cover Sheet and index of drawings
- Location and vicinity map including haul routes
- Site plan and details
- Grading and drainage plan and Details
- Utility plan with profiles and details
- Pavement plan and details
- Soils boring logs
- Turfing plans and details

a. Location Plan and Vicinity Map

A Vicinity Map consists of a small scale drawing of the project location, similar to a road map. A Location Plan consists of a small scale drawing showing the Government property or reservation limit with the construction project site shown. Show the Contracting Officer-approved Contractor

access and haul routes, load limits on bridges along haul routes, and the designated waste and/or borrow areas. Upon request, a reproducible base sheet will be provided by the Fort Worth District for the Contractor's use in preparing the Location Plan. A Project Location Plan and Haul Route Plan is provided as part of the RFP Package Attachment A Drawings C-1 and C-2

b. Site Plan

Show all the site layout information necessary to field locate the building, walks, parking lots, and all other appurtenances to be constructed for the project. All site related work to be constructed will be located by dimensions or coordinates. Identify all site related items such as curbs, pavements, walks, courtyards, bollards, trash enclosures, and retaining walls. Unless otherwise specified, site plans shall be at a scale of 1:400 or 1:500, . Existing or proposed contours shall not be shown on this Plan. The Site Plan, prior to adding the dimensions, shall serve as the base sheet to the other Plans, such as the Utilities Plan, Grading and Drainage Plans and the Turfing Plan. The Site Plan will show all existing physical features within and adjacent to the work site that will remain after the proposed construction has been completed. Include free zones, construction limits, storage areas, etc.

Show the building orientation and horizontal dimensional relationships to streets, walks, property lines, easements, fences, and other structures. Space between structures will provide open areas in accordance with good land-use planning and due consideration of future development plans. Maintain fire clearance separations for access for equipment acceptable to the installation (i.e. Installation Fire Chief). Show geometric features of all roads, streets, sidewalks and parking areas. Provide details of all site features.

c. Grading and Drainage Plan

Provide a grading and drainage plan at a scale of 1:400, 1:500, or 1:600 (1" = 20' or 1" = 30') unless otherwise specified. Indicate new and existing grading contours at 250 mm (1-foot) contour intervals. Provide spot elevations in sufficient numbers so that interpolation between contours is not required. Some examples are: corners of paved areas and parking lots, low points, high points, flow lines of ditches and swales, changes in degree of slope and grading at building corners to insure positive drainage from the facility.

Indicate finished floor elevation of new building(s). Finished floor elevations shall be a minimum of 300 mm (12 inches) above the highest point of the outside finished grade and slope away from the building. Finished floor shall be a minimum of 200mm above pavement surfaces. Grade contours shall be at 250 mm intervals and spot elevations shall be provided at all site development features.

Show layout of the new and existing storm drainage systems, including existing and new storm drainage flows, ditches, swales, piped systems, manholes, surface, and curb inlets.

Provide the appropriate top of structure elevations and pipe invert elevations of both the new and existing drainage system.

d. Erosion Control Plans

Erosion control plans shall show locations of all sediment basins,

diversion ditches, areas to receive rock blanket, and other erosion control structures, indicating the approximate drainage areas each will serve. Indicate the materials, construction, and capacity of each structure.

e. Composite Utilities Plan With Profiles And Details

If required, provide a Composite Utilities Plan at a scale of 1:400 or 1:500, . Indicate locations of new and existing utilities. Plans shall show layout of the new and existing storm drain systems, gas, sanitary sewer, fire protection, water, steam, and any other utility systems which need to be provided for. Include new and existing contours. Show mains and distribution lines as well as all appurtenances such as meters, manholes, and valves.

f. Grading Sections

Grading sections through the new building showing finished and existing grades may be provided to supplement the required grading plan.

g. Pavement Plan and Details

Provide pavement plans for all parking lots, roads, equipment pads, hardstands, and sidewalks. Include cross sections of all paving designs and include details of curbs, gutters, pads, sidewalks, stairs, inlets and other paving features. Provide a joint pattern for all concrete paved areas, indicating construction and contraction joint locations and dowel locations. Provide spot elevations on the joint pattern at a minimum of each joint crossing.

h. Soils Boring Logs

Soil Boring Logs and locations are provided under Attachment A Drawing numbers LB-1 and LB-2. These drawings shall be part of the design drawings.

3.8.3 Landscaping

Provide a Landscape Plan showing seeded and sodded areas. The Landscape Plan shall be prepared by a Licensed Landscape Architect. The landscape plan shall be in accordance with the Installation Design Guide. Select and specify types of plant materials that are locally grown, commercially available, and acclimated to the project environment. Include a plant materials schedule or listing which lists the botanical names, common names, key, size, and the method of transplanting for each landscape element. The landscape plan shall also show all unsurfaced ground areas disturbed by construction within the project limits with these areas shown to be seeded, sodded, or mulched as required. Include designs and details for required site furnishings and accessories.

The Contractor shall provide designs and details as necessary for required site furnishings and accessories.

3.8.4 Architectural Design

a. Floor Plans

Provide double line floor plan(s) of the entire building(s), drawn at the largest scale practicable to include the entire building or floor level on

a single sheet. The building footprint may be of a size that will require the floor plans to be divided into multiple areas. Floor plans shall be scaled double-line drawings showing the functional arrangement, structural column or bay indicators, material patterns, location of all openings and plumbing fixtures. Section cuts, wall types, notes and leaders, general notes, and dimensions shall be complete. The plans shall indicate room numbers and titles, door swings, door and window numbers and types. Provide door, window, louver, and other schedules as required. Show a north arrow on each floor plan. Include enlarged toilet room plans. The first floor plan sheet shall include a gross area tabulation comparing the actual square footage with the authorized square footage of the facility. Fully justify architect-engineer suggestions for plan improvement. Include:

- Overall, Control, Opening, and complete dimensioning
- Room Names and Numbers
- Wall and Building section cuts
- Door Swings and Numbers
- Window Types
- Square Footage
- General Notes

Where major structural elements are included as parts of architectural detailing, do not indicate sizes. Define these elements as part of the structural design documents. Major elements of mechanical and electrical equipment affecting space allocation shall be shown on the architectural plan to the extent practicable and coordinated with other respective disciplines. When applicable, Government-furnished and Contractor-installed, or Government-furnished and installed, items shall be shown as dashed lines.

b. Reflected Ceiling Plans

Reflected ceiling plans shall include all notes, complete legends and pocheing patterns of materials to be used. Provide reflected Ceiling Plans for all spaces in the building(s). Reflected ceiling plans shall show the ceiling tile layout and location of gypsum wallboard and other ceiling types where applicable. Show all light fixtures, air diffusers, grilles, registers, exit lights, public address speakers, fire alarm strobe lights, sprinkler head layout, ceiling mounted equipment access panels or removable ceiling tile and grid elements, smoke and heat detectors, wall fire ratings, ceiling mounted equipment removal pathways, ceiling mounted television mounts, and other ceiling mounted items. The fixtures and other equipment shall be laid out in a regular pattern symmetrical with the ceiling tile grid, or symmetrical with the room centerlines, columns, windows, or other feature that dominates. All ceiling mounted items shown shall be fully coordinated with all other disciplines.

c. Roof Plan

Roof plan shall be complete showing slopes, locations for roof and overflow drains, equipment, and walkways. Coordinate elements located on the roof with all disciplines.

d. Building Elevations

Provide all building elevations complete showing the appearance and architectural treatment. Elevations shall be dimensioned to show story height, total height, and relation to grade. Indicate critical elevations such as top of finish floor and top of steel.

e. Building Sections

Include building cross section and longitudinal sections to show general interior volumes, framing method, relationship to adjacent structures, and height of ceilings and partitions. Identify materials used and necessary dimensions.

f. Wall Sections

Drawings shall include all wall section conditions including enclosed corridor(s) showing vertical control elevations and dimensions. Label all materials. Cut sections should through doors, windows, and other critical wall section locations. Wall sections shall not be broken. Include additional details when necessary to illustrate abutting adjacent buildings and important or unusual features. All horizontal dimensions shall occur on the plans and vertical dimensions on the sections and elevations.

g. Room Finish Schedules

Include signage.

h. Door, Window, and Louver Schedules

Door schedule shall include door and frame types and references to door details and hardware sets. Window and louver schedules shall indicate window and louver types, sizes, and references to details.

i. Fire Ratings

Clearly indicate wall ratings and fire hazards as required by the National Fire Protection Association Codes (NFPA). See Military Handbook MIL HDBK 1008C, particularly Section 2.1 Basic Criteria and Section 2.1.2 Partitions.

In addition to the wall rating criteria required by the Codes, provide a minimum of one-hour rated wall assembly around all Janitors Closets, Store Rooms, Mechanical and Electrical Rooms or Closets. Wall fire ratings shall be graphically shown by a continuous symbol or pattern within the wall on the reflected ceiling plan and/or on a Fire Protection/Life Safety Plan. When other functions coexist with the fire protection functions, their integration shall be clearly indicated with an analysis that describes how both functions will be served. Provide a separate, composite type floor plan which makes an accurate presentation of these various features and functions. By authorized written permission, where the building and features being shown are unusually simple, this information may be included on other drawings. Rated wall details shall include the design number of the testing laboratory certifying the rating.

j. Modular Design

Use modular design practices for the design of all masonry buildings or components of buildings. Dimensions shall be figured to whole or half-unit lengths (in increments of 100 mm) in order to reduce on-site cutting of masonry. Units less than 102 mm long shall be avoided.

k. Room and Door Numbering

The Room and Door Numbering system shall be consistent for all buildings designed under any one contract. Room numbering shall start at the main entrance and proceed clockwise around functional areas.

1. Facility Elevation

The elevation of the first floor shall be indicated as 100 000 mm (100 feet) and shall be a minimum of 300 mm above finish grade. Elevation for other floors, footings, etc., shall be related to this figure. Sea level elevations shall not be shown on the building drawings. Show elevations of the first floor above sea level on the grading plan (Civil).

m. Access to Utilities

All utilities within the building, such as piping, ductwork, and electrical work, shall be concealed in finished areas unless otherwise specified in the Program and Performance Requirements. Provide plumbing chases in toilet areas. Carefully figure the clear space above ceilings and the size of chases to accommodate piping slopes and connections, ductwork crossovers, and fittings, HVAC piping and valve service spaces, and similar situations. Provide access to valves, cleanouts, etc. Space provided for utilities systems shall be adequate but not excessive.

3.8.5 Interior Design

Structural Interior Design (SID) Package, including floor plans, finish and color schedules, interior design analysis, and sample/color boards, in accordance with SWD-AEIM, Chapter III, paragraph "Interior Design." SID refers to the building related exterior and interior finishes. Use the design analysis to explain the desired image or visual appearance of the interior of the facility.

3.8.5.1 Submittal Requirements for SID/CID Notebooks (Color/Finish Sample Boards)

a. Furnish 4 sets of color/finish board(s) with attached samples of the proposed building-related finish materials mounted on 215 mm by 280 mm by 1.5 mm (8-1/2 inch by 11 inch by 1/16 inch) thick mat board in three-ring notebooks. Epoxy glue, hot-melt glue, or contact cement shall be used to attach samples; Scotch tape, double-backed tape, or rubber cement will not be acceptable. Heavy samples shall be mechanically fastened. Photographs or colored photocopies are not acceptable for material and color samples.

b. The notebooks shall be labeled on the outside spine and front cover with the phase percentage, CID, project title and location, Contract number, date, and the Contractor's name and address.

c. Sequence and Content of CID Submittal

The sequence and content of CID Submittals shall be as follows:

- (1) Title Page.
- (2) Table of Contents.
- (3) Narrative of Interior Design Objectives.
- (4) Exterior Elevation Drawing.
- (5) Exterior Building Material Legend.
- (6) Exterior Building Material Color Board(s).

(7) Room Finish Schedules.

(8) Interior Color Placement Plan.

(9) Interior Color Boards (according to color placement plan).

Each sample shall indicate color, texture, and finish; and, if patterned, shall be large enough to define full pattern. Samples shall be identified as to type of material, area of installation, manufacturer, and transmittal number under which certification of the material represented will be submitted in accordance with the requirements of Section 01330 CONSTRUCTION SUBMITTAL PROCEDURES.

(11) Signage Location Plans(s).

(12) Interior Signage Color Boards.

(13) Not used.

3.8.6 Structural Design

Drawings shall include foundation plans and details, floor framing plans for each floor when applicable, floor slab plans, and roof framing plans.

a. Show the location of all in-wall columns or pilasters.

b. Foundation and slab plans shall show the size and location of all foundation elements, such as foundation walls, grade beams and footings. Elevations for footings shall be indicated on the plan. Plans for slabs-on-grade and exterior stoop slabs at building entrances shall show location and type of joints, slab thicknesses and reinforcing, elevation of slab surfaces, and any other design features, such as equipment bases, heavy Lab equipments, isolated foundations and the in-slab electrical raceway, which affect the slab design.

c. The sizes, locations, and elevations of footings shall be shown.

d. Coordinate slab plans with the Electrical sheets and indicate the locations of in-slab electrical raceway trench ducts or similar items.

e. Show concrete slab-on-grade thicknesses and sections.

f. Show proposed treatment of special foundations and other unique or complex features and details.

g. Provide elevation views, sections, and details necessary to illustrate the design.

h. Roof framing plans shall show sufficient details to clearly indicate the type of framing system used, size, and spacing of members and their elevations.

i. Drawings shall include overall building plan dimensions, north arrows, and design notes.

j. Grid Systems, Dimensions, and Floor Elevations

Each foundation and slab plan and roof framing plan shall have an alpha-numeric grid system aligned with any in-wall columns or pilasters, or with load bearing and non-load bearing walls, as applicable. The same grid system shall be used for all plan views. Each plan view shown shall have all necessary dimensions. On plan views, the dimensions shall define the location of grid lines, offsets, and all structural elements, as well as the overall sizes of the structure. The finish elevation of the floor slab shall be indicated as 100 000 mm (100 feet), and elevations for foundations, walls and roof members shall be referenced to this basic elevation.

k. Plan Sheets

(1) Foundation and Slab Plans

Foundation and slab plans shall show the size and location of all foundation elements, such as foundation walls, grade beams and footings. Elevations for footings shall be indicated on the plan. Plans for slabs-on-grade and exterior stoop slabs at building entrances shall show location and type of joints, slab thicknesses and reinforcing, elevation of slab surfaces, and any other design features, such as equipment bases, heavy Lab equipments, isolated foundations and the in-slab electrical raceway, which affect the slab design.

(2) Roof Framing Plans

Roof framing plans shall be provided for all parts of the structure. Plans shall show the size, spacing, and location of all roof framing members, their supporting in-wall columns, pilasters or walls, all auxiliary members such as bracing and bridging, and the size and location of all major openings through the roof. Plans shall show support system for satellite dishes.

l. Elevation Views, Sections and Details Sheets

Elevation views, sections, and details necessary to illustrate fully the design shall be provided. Some requirements peculiar to the various structural materials are described below.

(1) Concrete

Include elevation views as necessary, plus sections and details to show the outlines of concrete cross-sections, reinforcing bar arrangements, concrete cover for rebar, installation of embedded items, and joint construction. All lap splice and embedment lengths for reinforcing bars shall be clearly indicated on the drawings. A sill detail for each foundation condition at exterior and interior doors shall be provided.

(2) Masonry

Wall reinforcing shall be located and identified on plans, in section cuts, elevation views, or in schedules. When required, include structural elevations to clarify the construction requirements for masonry reinforcement, especially the reinforcement around wall openings. Listed below are some frequently required masonry details, most of which are shown in ICBO Bldg Code and SWD-AEIM. Details may be extracted from other sources and incorporated into the final drawings.

Edit the details to reflect the specific requirements of this project.

(3) Structural Steel, Steel Joists, and Steel Decking

Structural steel connections shall be fully detailed and shown on the drawings. The anchorage of beams, trusses, joists, and steel deck to walls or other bearings, and the extra framing or reinforcement required at deck openings shall also be detailed. Notes, details, or schedules on the drawings shall indicate the steel deck attachment method to be used, and shall give the size and spacing for perimeter, side lap, intermediate supports and end lap attachments. Welded connections shall be detailed using standard weld symbols illustrated in AWS D1.1. All applicable weld sizes, spacing, types, contours, and finishes shall be shown.

(4) Cold-Formed Steel Studs

Cold-formed steel connections shall be fully detailed and shown on the drawings. The anchorage of studs to top and bottom runners, of top and bottom runners to supporting members, and the extra framing at openings shall also be detailed. Notes, details, or schedules on the drawings shall indicate the steel stud and runner dimensions, spacing, and attachments.

m. Schedules

(1) Foundation Schedules

Foundation schedules for footings or grade beams shall be included as applicable. The schedule shall include all pertinent information required for the foundation system being used.

(2) Framing Schedules

For concrete framing, beam, and column schedules shall conform to the requirements of the ACI SP-66. For structural steel framing, provide a column schedule complete with design loads at splices, if any, and at column bases, plus a tabulation of the loads, shears, moments and/or axial loads to be resisted by the beams and their connections.

n. Equipment Loads

All equipment loads which exceed 80 kg and are not supported by concrete slab-on-grade, shall be identified on the drawings by showing equipment locations, total weights, and reaction loads at support points.

o. Notes

(1) Design Notes

Under the heading "Designer's Notes," the structural drawings shall contain notes which begin:

"The structural design was prepared using the following data:".

The data then listed shall include the structural loading criteria used for design, such as roof and floor live loads, snow load design

parameters, wind speed and wind load design parameters, seismic design parameters (MCE, Ss, Sl, and Soil Profile Type), allowable soil bearing pressures (as recommended by the foundation analysis), foundation design depth, design wind uplift pressures for steel joists and other data pertinent to future alterations. Also, to be listed are the ASTM designations and stress grades of the applicable structural materials: steel, masonry, concrete for each usage, reinforcing bars, and bolts.

(2) General Notes

Other notes, which direct the work to be performed, the materials to be used, etc., shall be grouped under the heading of "General Notes." Include in these notes a description of the building's structural system, if necessary.

3.8.7 Mechanical Design

Provide plans, piping diagrams and isometrics, mechanical room sections, water and air flow diagrams, details, schedules, control diagrams, sequence of operations, etc. as necessary to define the required design intent. Floor plans shall use the architectural floor plans as a basis, with the building outline half-toned. Large-scale plans of congested areas shall be provided. Coordinate with architectural design for provision of access panels for all concealed valves, traps and air vents, etc. Unless otherwise indicated, all floor plans shall be drawn at a minimum 1:100 (1/8-inch = 1'-0") scale and shall show room names and numbers. Drawings shall include, but not limited to, the following:

a. Mechanical Abbreviation, Legend, and General Notes Sheet

This sheet shall include all mechanical abbreviations and symbols that will be used on the drawings. Include mechanical general installation notes that are required to clarify the construction intent that may not be readily apparent in the specifications or on the drawings. Symbols shall be grouped into sections; as a minimum, provide sections for Plumbing and HVAC. Control drawing symbols shall be shown on a separate drawing.

b. Plumbing Drawings

Plumbing Plans: Plumbing plans show show the design and layout of the domestic hot and cold water distribution systems; make-up water piping; soil, waste and vent piping; and storm water drainage system. Include routing of piping systems from the connections within the structure to a point 1.5 meters (5 feet) outside the structure. The grade of all drain lines shall be calculated and invert elevations established. All plans shall show plumbing fixtures. All electrical panels and equipment and pertinent HVAC equipment (e.g. chillers, expansion tanks, boilers, AHU's, pumps) shall be outlined in half-tone on the plumbing plans. Plans may be drawn at 1:100 (1/8 inch = 1 foot) scale as long as legibility is not compromised. Plumbing fixtures and drains shown on the drawings shall be designated by the same identification system used in the Construction Specification Plumbing Fixture Schedule. Soil, waste, vent and storm drainage piping shall be shown on separate sheets from cold and hot water distribution piping and make-up water piping. Provide a roof plan showing roof drains and sanitary vent penetrations. Include the following:

(1) Enlarged toilet room plans showing all fixtures, water,

waste, and vent piping for each toilet area.

(2) Plumbing water and waste/vent riser diagrams for each toilet area. Provide plumbing water and waste/vent riser diagrams for each toilet area.

(3) Enlarged mechanical and boiler room plumbing plans, drawn at a minimum 1:50 scale, showing layout of all plumbing equipment and piping within the rooms. To show spatial relationships, indicate the location of HVAC equipment, gas service, condenser water or chilled water entrances, fire protection entrance and risers, and electrical panels or equipment located in the room.

(4) Plumbing details, including those for roof and overflow drains, and schedules.

c. Mechanical HVAC Drawings, Details, and Schedules

Show on mechanical HVAC drawings, all items of mechanical equipment, including chilled water equipment, condenser unit air handling units, air distribution and exhaust systems, etc., to clearly illustrate all HVAC system designs, and to determine proper space allocation within the intent of the architectural layout requirements. Plans and sections shall be developed sufficiently to ensure that major equipment items, piping, and ductwork cause no interference with structural members, electrical equipment, etc. Provide Schedules for each item of mechanical equipment. Provide installation details showing specification requirements such as isolation and balancing valves, thermometers, pressure gauges, equipment pads, strainers, vents, hangers, and vibration isolation for each item of mechanical equipment. Include enlarged mechanical and boiler room floor plans showing the layout of all HVAC equipment, piping, and ducts located within the rooms and dedicated access space for items requiring maintenance; and drawn at a minimum 1:50 (1/4 inch = 1'-0") scale. Provide mechanical sections to show equipment and components, ductwork connections and routing, and relationship to adjacent structural features. Provide chilled and hot water system flow diagrams, showing piping, pumps, and all connected cooling and heating equipment. Show associated GPM flow rates. Provide airflow diagrams showing CFM quantities for outside air, return air, and supply air; supply-air side of each diagram shall be broken down into zones, with each zone supply, return, and relief/exhaust CFM quantities identified.

Mechanical HVAC Plans: Mechanical HVAC plans shall show the design and layout of the hot water piping distribution system and equipment, air supply and distribution systems, and ventilation and exhaust systems. Air supply and distribution systems shall show all ductwork, including supply and return mains, branch ducts, and terminal unit (single and dual duct VAV and CV boxes) takeoffs; ductwork to diffusers; diffusers, grilles, and registers; and fire and fire/smoke dampers.

d. HVAC Control Drawings

Provide a one-line control diagram showing DDC interface points, detailed sequence of operations, and DDC control points list for all mechanical equipment and systems in accordance with SWD-AEIM, Chapter V.

3.8.8 Electrical Design

Provide plans, electrical and UPS room sections, single-line diagrams,

riser diagrams, details, and schedules as necessary to define the required design intent. Coordinate the electrical and communications design with the design for other disciplines. Floor plans shall use the architectural floor plans as a basis with the building outline half-toned. Unless otherwise indicated, all floor plans shall be drawn at a minimum 1:50 (1/4-inch = 1'-0") scale and shall show room names and numbers. Include the following as applicable:

- a. Electrical Abbreviations and Legends
- b. Drawing Notes
- c. One-Line Diagram

Detail the complete electrical system with a simplified one-line diagram. The diagram shall show ratings of major equipment including short circuit ratings. Use standard symbols for electrical equipment including, but not limited to, switchgear, sectionalizing cabinets, transformers, generators, uninterruptible power systems (UPS), switchboards, panel boards, power distribution units (PDUs), motor control centers (MCCs), motor starters. Include switchgear fuses or circuit breaker ratings; transformer ratings (including K-ratings) and connection configuration; switchboard ratings (including metering); panelboard current and ampere interrupting current (AIC) ratings; PDU ratings (including isolation transformers and K-ratings), raceway and conduit sizes and material type; MCC ratings; motor starter ratings; and conductor and ground type, size, and insulation ratings.

- d. Riser Diagrams
- e. Power Plan

Detail the electrical wiring for outlets, including raised floor receptacles, other than lighting. Identify rooms by name and number. When applicable, include a power cable tray plan and communications tray plan, detailing the underfloor cable tray components, outlets, and routing.

- f. Lighting Plan

Detail the electrical wiring and switching for lighting. Identify rooms by name and number.

- g. Lighting Fixture Schedule
- h. Panelboard and PDU Schedules

Detail the circuits and circuit breakers or fuse locations in various panelboards, including panelboards in power distribution units (PDUs). Panelboard schedules shall include the designation, location, mounting (flush or surface), number of phases and wires, voltage, capacity and total connected and demand load. Indicate the trip rating, frame size, interrupting rating, and number of poles for each circuit breaker in the panelboards. List the circuit number, circuit description, and load for each branch circuit. Include estimated maximum demand for each panel and for entire building and other relative information.

- i. Emergency Systems

Detail the electrical requirements for emergency systems such as emergency

generator, UPS, emergency lighting, and fire alarm system (coordinate with fire protection plans).

j. Site Plan

Detail the connection of pad-mounted switchgear, pad-mounted sectionalizing cabinets, vaults, and underground electrical and communications ducts. Show utilities the underground electric lines and communications ducts will cross.

k. Communications System

Detail the conduit and raceways required to support communications and audio/visual systems requirements, including, but not limited to intercoms, security, cable television, computer data, data transmission (local area network), and telephone.

l. Security System

Detail security camera and alarm requirements, and riser diagrams.

m. Lightning Protection System

Detail the lightning protection system including air terminal types and locations; cross and down conductor material, sizes and connections; ground rod material, sizes, and locations; ground counterpoise materials, sizes, and routing, and test well construction and locations. Show locations of all air terminals, roof conductors, down conductors, ground rods, and counterpoise.

n. Grounding System

Show locations for and detail grounding electrode; grounding conductor and bond materials, sizes, and locations; and isolation grounds.

o. Cathodic Protection System

Detail test point construction and locations, sacrificial anode systems, impressed current systems, etc.

p. Miscellaneous Details

Provide communications manhole details, electric vault details, special light fixture details, etc.

3.8.9 Fire Protection Design

Provide plans, diagrams, sections, and details as necessary to define the required design intent. Floor plans shall use the architectural floor plans as a basis, with the building outline half-toned. Unless otherwise indicated, floor plans shall be drawn at a minimum 1:100 (1/8 inch = 1'-0") scale and shall show room names and numbers. Drawings shall include, but not limited to, the following:

a. Fire Protection Plans

Show the following on the fire protection plans:

- fire service entry and size to a point 1525 mm (5 feet) outside of building;

- back flow preventer and size;
- system riser and size;
- zone risers, fire department connection, alarm bell, detectors, zones, room by room occupancy hazards and ceiling types per zone in tabular format, general description of system, applicable NFPA codes listing, sprinkler type per ceiling and application;
- water demand data, including design density, hose allowance, and design area for each applicable occupancy hazard; and
- a note stating that system shall be hydraulically designed.

Plans shall not show sprinkler piping or heads, unless it is necessary for coordination or system definition in special applications.

b. Fire Protection Details

Include the following fire protection details:

- mechanical riser diagram, including all pipe sizes;
- electrical riser diagram;
- any necessary sections to show routing of piping or sprinkler head locations, fire service entrance detail, exterior wall and slab penetration details, hydraulic design data from flow test provided by Government, hydrant designations from flow test, and fire protection symbols list.

c. Site Plan

Include:

- underground fire service main routing and size, from point of connection at existing water main, to building entry point;
- and fire hydrant locations used in flow test.

Label fire hydrants to match flow test designations shown on drawings and described in design analysis.

d. Life Safety Plan

Show:

- location of fire separation walls, column, floor and roof protection,
- path of travel for emergency egress and panic exits,
- access to building for fire fighting,
- rated doors and windows,
- requirement for mechanical and electrical penetrations through fire separation walls and floors,
- placement of fire extinguishers, and
- occupancy types.

3.8.10 Environmental Design

Provide the following items:

Environmental Survey Sampling Plan (not in this CONTRACT)

Basic Stormwater Pollution Prevention Plan (see requirements for 60% design submittal)

The Contractor shall submit for Government review and approval a basic stormwater pollution prevention plan developed in accordance with Section 01410 ENVIRONMENT PROTECTION, and Section 01421 OUTLINE OF A BASIC STORM

WATER POLLUTION PREVENTION PLAN.

Plans for Storm Water Controls and Implementation of Pollution Prevention Plan (see requirements for 60% design submittal)

The Contractor shall also provide drawings that describe stormwater control details to be used and denote where these stormwater controls will be implemented during the various phases of construction of the new facility .

Design Analysis (also see requirements discussed for 60% design submittal)

The Contractor shall prepare a Chapter in the Design Analysis entitled: "Environmental Protection Compliance". This Chapter shall summarize how the project complies with all environmental laws and regulations. As a minimum, the Chapter shall include the following:

- a. The Permitting and/or Approving Authority(ies) (also see Section 01410 ENVIRONMENT PROTECTION).
- b. Construction/Operating Permits, Notices, Reviews and/or Approvals required. If, when checking with the agencies, a permit, notice or approval is not required, include a copy of the telephone conversation memorandum or letter from the agency (also see Section 01410 ENVIRONMENT PROTECTION).
- c. Time required by the permitting agency(ies) to process the application(s) and issue the permits (also see Section 01410 ENVIRONMENT PROTECTION).
- d. Fee schedule including filing/application fees, review fees, emissions fees, certification testing, etc.
- e. Monitoring and/or compliance testing requirements.
- f. Actual Environmental regulations governing the applications, exemptions, variances, etc. or at a minimum a brief summary of the regulation and title.

3.9 ATTACHMENTS

Attachments A, B, and C follow this page.

3.9.1 **ATTACHMENT A****CODE ANALYSIS**

UNIFORM BUILDING CODE (UBC) AND NFPA "LIFE SAFETY CODE" ANALYSIS

LIFE SAFETY AND FIRE PROTECTION IS AN INTEGRAL PART OF EVERY FACILITY DESIGN. RECOGNIZED CODES AND ACCEPTED SAFETY STANDARDS SHALL BE FOLLOWED IN THE DESIGN OF ALL FACILITIES. OF THE VARIOUS CODES AND SAFETY STANDARDS THE NATIONAL FIRE PROTECTION ASSOC. (NFPA) "LIFE SAFETY CODE" SHALL TAKE PRECEDENCE. ALL APPLICABLE REQUIREMENTS OF THE LIFE SAFETY CODE SHALL BE INCORPORATED INTO EACH DESIGN. FOR TYPE OF CONSTRUCTION, FIRE AREA LIMITATIONS, AND ALLOWABLE BUILDING HEIGHTS THE DESIGN SHALL FOLLOW THE UNIFORM BUILDING CODE (UBC).

CHECK LIST

PROJECT NAME _____ DATE _____

LOCATION _____

3.9.1.1 UNIFORM BUILDING CODE ANALYSIS

a. OCCUPANCY CLASSIFICATION (See Table 5A):

Area:	Classification:
(GROUP: _____):	Div. _____
(GROUP: _____):	Div. _____
(GROUP: _____):	Div. _____

PRINCIPAL OCCUPANCY _____

OTHERS (SPECIFY) _____

b. TYPE OF CONSTRUCTION :

c. OCCUPANCY SEPERATION REQUIRED (SEE TABLE 5-B):

_____	TO	_____	=	_____	HRS
_____	TO	_____	=	_____	HRS
_____	TO	_____	=	_____	HRS
_____	TO	_____	=	_____	HRS

d. FIRE RESISTANCE OF EXTERIOR WALLS: (SEE TABLE 5-A)

NORTH _____

SOUTH _____
EAST _____
WEST _____
OTHER _____

e. OPENINGS IN EXTERIOR WALLS: (SEE TABLE 5-A)

NORTH _____
SOUTH _____
EAST _____
WEST _____
OTHER _____

f. MAX. ALLOWABLE FLOOR AREA (SEE TABLE 5-C):

ALLOWABLE:

IF SPRINKLERED: _____

ALLOW. AREA INCREASES _____

CALCULATED ACTUAL FLOOR AREA:

Floor	Square Footage
-------	----------------

Totals:

g. MAX. ALLOWABLE HEIGHT (SEE TABLE 5-D):

METERS (FEET): _____

STORIES: _____

Proposed Height of Building: _____

Actual No. of Stories: _____

h. COMMENTS:

DESIGNER: _____

a. CLASSIFICATION OF OCCUPANCY:

HAZARD OF CONTENTS:

LOW

ORDINARY

HIGH

b. FIRE RESISTIVE REQUIREMENTS:

EXTERIOR WALLS: _____ HRS _____

INTERIOR WALLS: _____ HRS _____

STRUCTURAL FRAME: _____ HRS _____

VERTICAL OPENINGS: _____ HRS _____

FLOORS: _____ HRS _____

ROOFS: _____ HRS _____

EXTERIOR DOORS: _____ HRS _____

EXTERIOR WINDOWS: _____ HRS _____

BOILER ROOM ENCLOSURE _____ HRS _____

OTHER (LIST) _____ HRS _____

_____ HRS _____

_____ HRS _____

_____ HRS _____

c. MEANS OF EGRESS:

OCCUPANCY LOAD FACTOR: _____

OCCUPANCY	FACTOR	ACTUAL AREA	ACTUAL LOAD
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

d. NUMBER OF EXITS REQUIRED:

e. MINIMUM WIDTH OF EXITS:

CALCULATED: _____

ACTUAL: _____

f. MAXIMUM ALLOWABLE TRAVEL DISTANCE TO EXIT:

WITH SPRINKLERS: _____

g. EXIT DOORS:

MINIMUM WIDTH ALLOWED: _____

MAXIMUM LEAF WIDTH ALLOWED: _____

WIDTH REQUIRED FOR NO.OF OCCUPANTS: _____

h. EXIT CORRIDORS:

MAX. COMMON PATH OF TRAVEL: _____

MINIMUM ALLOWABLE WIDTH: _____

REQUIRED TO HAVE EXIT AT EACH END OF CORRIDOR?

DEAD END CORRIDORS ALLOWED? _____

MAXIMUM LENGTH: _____

WALL FIRE RESISTANCE REQUIRED: _____

DOORS & FRAME FIRE RESISTANCE REQUIRED:

i. STAIRS:

MINIMUM WIDTH _____ FOR OCCUP. LOAD OF _____

MINIMUM WIDTH _____ FOR OCCUP. LOAD OF _____

MINIMUM WIDTH _____ FOR OCCUP. LOAD OF _____

MINIMUM WIDTH _____ FOR OCCUP. LOAD OF _____

MAX. RISER ALLOWED: _____

MINIMUM TREAD ALLOWED: _____

LANDINGS:

MIN. SIZE: _____

MAX. VERTICAL DIST. BETWEEN LANDINGS: _____

REQUIRED HEIGHT OF RAILINGS:

HANDRAILS:

REQUIRED AT EACH SIDE? _____

INTERMEDIATE RAIL REQUIRED? _____

HEIGHT ABOVE NOSING _____

INTERMEDIATE RAIL REQUIRED? _____

MAX. SPACE ALLOWED BETWEEN RAILS: _____

STAIR ENCLOSURE REQUIRED? _____

STAIR TO ROOF REQUIRED? _____

STAIR TO BASEMENT REQUIRED? _____

j. HATCHWAY ACCESS TO ROOF REQUIRED? _____

k. LADDER ACCESS TO ROOF REQUIRED?

l. HORIZONTAL EXIT REQUIREMENTS:

m. PROTECTION OF OPENINGS NEAR EXTERIOR STAIR EXIT DOORS:

n. SMOKEPROOF ENCLOSURE REQUIRED:

o. RAMPS:

MAX. SLOPE TO USE AS EXIT _____
HANDRAILS REQUIRED? _____

p. COMMENTS:

DESIGNER: _____

FOLLOWING IS A LIST OF ADDITIONAL "NFPA" CODES THAT ARE COMMONLY USED.
INDICATE WHICH OF THESE CODES ARE USED AND ADD THOSE REQUIREMENTS TO THIS
ANALYSIS.

NFPA 10	FIRE EXTINGUISHERS, PORTABLE
NFPA 75	COMPUTER/DATA PROCESSING FACILITIES
NFPA 80	FIRE DOORS AND WINDOWS
NFPA 88A	PARKING STRUCTURES
NFPA 409	AIRCRAFT HANGARS
AFM 88-4	DATA PROCESSING FAC. DESIGN AND CONST.
AF ETL 89-3	FIRE PROTECTION CRITERIA FOR ELECTRONIC

Typed Name and Signature of the
Licensed Architect/Engineer of Record
Professional Seal of the Licensed Architect/Engineer of Record

3.9.2 ATTACHMENT C

MECHANICAL ROOM SIZE FORM

NOTE: Mechanical Systems Design Documents and Guides -
Mechanical Room Size Form

At the final design stage, the mechanical designer shall
fill out this Mechanical Room Size Form and include it in
the final design calculations.

The information submitted on this sheet shall be placed in a data base for
future use on similar DoD, COE project. (The data base shall be used to
help determine appropriate mechanical room sizes). Include this sheet in
the final design calculations.

Project:

Location:

Engineer:

Gross floor area of building:

Gross square footage includes (the entire building) stairs, corridors, etc.

Floor area of mechanical room:

Percent of gross building area is the mechanical room size:

Type of facility:

Sources of energy (E, G, S):

Mechanical equipment:

List of equipment outside the mechanical room and location:

Is the mechanical room too small?

Does the User think the mech room is too small? (Y, N, Don't know)

Additional remarks:

Abbreviations:

AC - air compressor

AHU - air handling unit

B - boiler

CU - air cooled condensing unit

DF - direct fired

DX - direct expansion chilled water heat exchanger

E - electric

FC - fan coil unit
FP - fire protection
G - natural gas or propane
HX - heat exchanger
LC - liquid chiller
MUA - make up air unit
UH - unit heater
ST - domestic hot water storage tank
S - steam

-- End of Section --

SECTION 01368

SPECIAL PROJECT PROCEDURES FOR FORT HOOD

06/2001

AMENDMENT NO. 0005

PART 1 GENERAL

This Section covers the project requirements unique to Fort Hood, Texas. These unique requirements relate to items such as the digging permit process; use of Fort Hood airfields; tracer wire and marking tape specifications for the location of utility systems; Fort Hood landfill operations and permit requirements; local jacking, boring, and tunneling requirements; backflow prevention assembly documentation; and Customer Service Inspection certifications.

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Casing Pipe; G

10 days prior to jacking, boring, and tunneling activity, furnish catalog data for casing pipe.

SD-04 Samples

Plastic Marking Tape and Tracer Wire; G

10 days prior to installation of utilities, furnish 305 mm long samples of marking tape for each applicable utility. Furnish 305 mm long sample of the tracer wire.

SD-07 Certificates

Customer Service Inspections; G.

The Contractor shall supply a "Customer Service Inspection" certificate for the water supply in accordance with the Texas Natural Resource Conservation Commission (TNRCC) regulations. The completed and signed certificate shall be submitted to the Contracting Officer for review and final approval. A blank certificate is located at the end of this section. See paragraph CUSTOMER SERVICE INSPECTIONS for additional information.

Digging Permits; G.

Digging permits must be obtained prior to any digging, drilling or excavation. See paragraph DIGGING PERMITS for additional information.

Fort Hood Airfield Use; G.

Installation Airfield use is prohibited unless DA Forms 5205-R, 5206-R and 5207-R are completed, submitted and approved. See paragraph FORT HOOD AIRFIELDS for additional information.

Landfill Permit; G.

Contractor shall obtain permission from Fort Hood's Directorate of Public Works (DPW) to use the Post's landfill. Submit documentation granting permission and a completed landfill permit to the Contracting Officer prior to start of construction. A blank permit form is located at the end of this section. See paragraph CONDITIONS FOR USE OF FORT HOOD LANDFILL for additional information.

Backflow Prevention Assembly Tests; G.

Certification of proper operation of backflow preventers shall be accomplished in accordance with state regulations by an individual certified by the state to perform such tests. If no state requirement exists, the Contractor shall have the manufacturer's representative test the device to ensure the unit is properly installed and performing as intended. **The Contractor shall provide written documentation complete and submit, at the time of the final inspection for the facility, the certificate "Appendix F. Sample Backflow Prevention Assembly Test and Maintenance Report" for the water supply, indicating that the tests have been performed and that the backflow preventers operate properly in accordance with SECTION 15400 PLUMBING, GENERAL and the Texas Natural Resource Conservation Commission (TNRCC) regulations. The TNRCC rule covering this requirement is Texas Code Title 30. Part I. Chapter 290. Subchapter F (see paragraph 290.47(f)). This certificate shall be signed by the individual performing the tests. The completed certificate shall be submitted to the Contracting Officer for review and final approval. (AM#5)**

A copy of the rule and sample of the form (appendix D) can be obtained from the TNRCC's home page at the web site: www.tnrcc.state.tx.us or http://info.sos.state.tx.us/fids/30_0290_0047-23.html. (AM#5)

1.2 FORT HOOD AIRFIELD USE

Contractors performing work under this contract may use airfields at Fort Hood with prior written notification and approval, providing:

a. All requests for Installation Airfield use shall be coordinated through the Office of the Commander, Installation Airfields, AFZF-DPC-AC, Hood Army Airfield, Fort Hood, TX 76544, telephone (254) 287-4266/5838.

b. Potential users shall submit completed DA Forms 5205-R (Certificate of Insurance), 5206-R (Civil Aircraft Landing Permit), and 5207-R (Hold Harmless Agreement). Forms are available through the Point of Contact (POC) mentioned in paragraph (a) above. User requests and specified forms shall be submitted at least 60 days before the first intended landing.

1.3 DIGGING PERMITS

The Contractor shall obtain digging permits directly from the Fort Hood Post DPW before any drilling, digging, or excavation is undertaken. Provide a completed form FHT 420-X10, Coordination for Land Excavation, to the DPW building 4612, Fort Hood, Texas for each permit. Allow 20 days for Government review of digging permit requests. A digging permit for a specified area of excavation expires 30 days after the issue date; Contractor must re-apply for a new permit to perform excavation in the area if the excavation was not started within the 30-day period. Permits will identify all underground utilities within 1500 mm of the designated area. Contractor shall be responsible for all repairs, costs, and damages due to excavating without permit or damaging an identified utility. Unidentified utilities shall be repaired by the Contractor at Government expense.

1.4 UTILITY INSTALLATION REQUIREMENTS

1.4.1 Plastic Marking Tape and Tracer Wire

In lieu of furnishing marking tape manufactured with integral wires, foil backing, or other means to enable detection by a metal detector when the tape is buried as specified in the Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS, Part 2 paragraph PLASTIC MARKING TAPE, furnish and install the following marking tape and tracer wire:

a. Plastic Marking Tape

Plastic marking tape shall be acid and alkali-resistant polyethylene film, 152 mm wide with minimum thickness of 0.102 mm (0.004 inch). Tape shall have a minimum strength of 12.1 MPa (1750 psi) lengthwise and 10.3 MPa (1500 psi) crosswise. The tape shall be of a type specifically manufactured for marking underground utilities. Tape shall be color as specified in Table 1 and bear a continuous printed inscription describing the specific utility.

TABLE 1. Tape Color

Red:	Electric
Orange:	Telephone, Telegraph, Television, Police, and Fire Communications
Yellow:	Gas
Blue	Water
Green	Wastewater

b. Tracer Wire

For gas, water, force sanitary sewer mains and other pressurized utility systems, place No.10 AWG, THWN, CU, direct burial in trench bottom prior to sandbedding, and brought up in valve boxes and risers, with 12 inches minimum leads above finished grade. Only direct-burial splices shall be used. Tracer is not required for underground electrical.

1.4.2 Jacking, Boring, and Tunneling

Conduct boring and jacking in a manner which does not interfere with the operation of the railroad or street or weakens or damages the embankment or structure. Bore or jack from the low or downstream end wherever possible.

Unless otherwise shown or specified, the top of the casing pipe shall be a minimum of 914 mm below the finished road surface and 1220 mm below the bottom of the railroad track ballast.

a. Utilities

Excavate where possible and verify the location and depth of buried utilities which will be crossed.

b. Casing Pipe

Smooth wall steel pipe, ASTM A 53 with welded joints. Minimum wall thickness of 4.76 mm unless otherwise shown or specified.

c. Casing

Unless otherwise indicated or specified, install a casing pipe of a diameter which provides a minimum of 50 mm clearance between the outside diameter of the carrier pipe joint and the inside wall of the casing. Upon installation of the carrier pipe, sand grout the entire annular space between the casing and carrier pipe walls.

d. Protection

Comply with the provisions of Part 3 paragraph "Trench Excavation Requirements" of Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Sheath and brace end trenches which are cut in the sides of embankments and beyond.

1.5 CONDITIONS FOR USE OF FORT HOOD LANDFILL

Use of the Fort Hood Municipal Solid Waste Landfill, located at the intersection of Turkey Run Road and Clark Road, by the Contractor is subject to the operating requirements imposed on the landfill by the Landfill Operating Permit. All waste delivered to the landfill will be inspected by the landfill operating Contractor for materials that are not authorized in the landfill. Trucks that contain unauthorized waste will be diverted for removal of the unauthorized material before being allowed to proceed to the working facility to dump their load. Landfill operating hours are 0730-1700 Monday through Friday and 0730-1400 on Saturday. Questions concerning landfill policy and procedures may be answered by calling the landfill at 532-2256.

The following classes of materials are not authorized in the Fort Hood Municipal Solid Waste Landfill and will be diverted as described below:

Recycle Materials: Cardboard and paperboard, light metal, aluminum and steel containers, paper, and plastic containers. Trucks entering the landfill with recyclable materials will be directed to a series of roll-off containers located at the entrance to the landfill for removal of the materials. Contractor/Transporters will be responsible for removing the unauthorized materials from the load and placing them in the properly marked container before proceeding to dump their load.

Compost Materials: Untreated wood, branches, shrubs, grass, woodchips, unserviceable or odd sized pallets should be separated from the refuse load and delivered to the Fort Hood Compose Center located across Turkey Run Road from the landfill.

Clean Fill Material and Inert Constructions and Demolition Wastes:

Soil, sand, sod, rock, clean masonry, brick, concrete, and pavement. These materials are not accepted at the landfill. Trucks containing the materials must be disposed of as directed by the Contracting Officer (KO) or the KO's Authorized representative.

Salvageable Items: Tires, white goods and appliances, bulk scrap metal, lead-acid batteries, and engine and machine parts. Salvageable items should be delivered to DRMO Bldg. 4286, located at 80th St and Tank Destroyer Blvd, phone 287-2723, Monday-Thursday, 0730-1300.

Serviceable Pallets: Serviceable pallets are to be delivered to Post Recycling Center Bldg. 4621, located at 65th St. and Railhead Dr., phone 287-6732, Monday-Friday, 0730-1600.)

Freon: Freon shall be collected in 50 pound retrievable containers and turned in to DPW supply, Bldg. 4406, 77th and Warehouse, phone 288-2383, Monday-Thursday, 0630-1700. An empty container will be furnished upon turn-in of the full container. Each container must be labeled (R-12, R-22, etc.) and shall not be mixed. If Freon is unintentionally mixed, the Contractor shall properly label the container as mixed and inform the DPW supply of the suspected mixture.

Regulated Waste: Regulated wastes such as liquid waste, fluorescent light bulbs, oil filters, ordinance, explosives, pressurized gases, PCB ballasts, paints, solvents, antifreeze, pesticides, herbicides, radioactive material, and biohazardous material are not accepted at the landfill. Regulated waste shall be delivered to the DPW Waste Classification Unit, Bldg. 1345, located at 37th and North Ave., phone 288-SNAP, Monday-Friday, 0800-1600, unless otherwise specified in the Contract. **All turn-ins are by appointment only.** Call the DPW Classification Unit, 288-7627, to schedule an appointment. The DPW Classification Unit can help contractors with containers, packing procedures, waste classifications, and state notification.

Asbestos: Generator manifests must be obtained from the DPW Waste Classification Unit, Bldg. 1345, located at 37th and North Ave, phone 288-7627, Monday-Friday, 0800-1600. The transporter must have two originally signed manifests and then give the landfill 24 hours prior notice, phone 532-2256. Delivery of asbestos containing material (ACM), friable and non-friable, must be made prior to 1200 on the day of delivery. All ACM must be double bagged, in an enclosed trailer, off-loaded by hand and the driver must have two originally signed manifests. One large bundle is not acceptable due to the possibility of bag breakage upon off-loading and disposal activities. Non-friable ACM that has been damaged or has the potential of being damaged by offloading, grinding, cutting, sanding, disposal or other invasive actions must also be double bagged.

Special Wastes: Properly characterized special wastes including fuel (TPH) contaminated soils (<1500 ppm), and demolition debris contaminated with lead paint (TCLP <5.0 mg/L) are allowed in the landfill. Documentation of all characterization tests must be provided to the Fort Hood DPW Waste Classification Unit and the landfill manager a minimum 48 hours prior to delivery of the material to the landfill. The Transporter must have a properly completed manifest at the time of delivery to the landfill. Copies of the Landfill's Waste Acceptance Plan, which contains specific requirements for disposal of the materials may be obtained from DPW Environmental, phone 287-8713; DPW Services, phone 287-9606 or 288-7842; or the Landfill Operating Contractor, phone 532-2256.

The requirements of this clause are not intended to limit the Contractor's rights; the Contractor may dispose of recyclable, salvageable, regulated materials in any lawful manner the Contractor chooses outside of Fort Hood boundaries to the extent allowed by other contract provisions.

1.5.1 Landfill Permit

Contractor shall complete the attached Landfill Permit and give copies, laminated or inserted in page protectors, to drivers so that the drivers could leave them in their trucks. Drivers can just hand the permit to the scale operator at the landfill rather than having to remember all information.

1.6 CUSTOMER SERVICE INSPECTIONS

1.6.1 Certification Requirements

The Rules and Regulations for Public Water Systems (TNRCC publication number RG-193) require a customer service inspection certification before providing continuous water service for the following conditions: New construction involving plumbing or mechanical systems; or Material improvement, correction, or addition to plumbing or mechanical systems.

1.6.2 Inspection

The Customer Service Inspection certifies that for work done under this contract:

- A. No direct connection between the public drinking water supply and a potential source of contamination exists;
- B. No cross-connection between the public drinking water supply and a private water system exists;
- C. No connection exists which would allow the return of water used for condensing, cooling industrial processes back to the public water supply;
- D. No pipe or pipe fitting which contains more than 8.0 percent lead exists in private water distribution facilities installed on or after July 1, 1988; or
- E. No solder or flux which contains more than 0.2 percent lead exists in private water distribution facilities installed on or after July 1, 1988.

1.6.3 Inspection Personnel

Customer Service Inspections must be performed by personnel meeting the requirements described in the *Rules and Regulations for Public Water Systems*. Examples are individuals licensed by the Plumbing Examiners Board (Licensed Plumbers or Plumbing Inspectors) or Certified Waterworks Operators and members of other water-related professional groups who hold an endorsement granted by the commission or its designated agent (have been to the 10 hour training approved by TNRCC).

1.6.4 Inspection Certification Form

Original copies of the Customer Service Inspection Certification shall be provided to the Contracting Officer's Representative prior to final inspection and acceptance. Certification forms will be maintained by the Fort Hood DPW Water and Wastewater Utility representative. A sample form is provided at the end of this section. The form (appendix D) can also be downloaded from the TNRCC's home page at the web site http://info.sos.state.tx.us/fids/30_0290_0047-22.html. (AM#5)

1.7 Appendix F Sample Backflow Prevention Assembly Test & Maint. Report

The certificate "Appendix F. Sample Backflow Prevention Assembly Test and Maintenance Report" is attached at the end of this section. (AM#5)

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

LANDFILL PERMIT
US ARMY Corps of Engineers

COE POC and telephone phone number: _____

Contract Name: _____

Contract Number: _____

Contract completion date or end of authorization date: _____

Building or areas affected (i.e., Soldier's Development Center):

Prime Contractor's Name: _____

Contractor POC and phone (i.e. someone on site that can get immediate
action): _____

CUSTOMER SERVICE INSPECTION CERTIFICATION

Fort Hood Texas Public Water System

Location of Service: _____

I, _____, upon inspection of the water distribution facilities connected to the aforementioned Fort Hood water supply do hereby certify that, to the best of my knowledge:

	Compliance	Non-compliance
1. No direct connection between the public drinking water supply and a potential source of contamination exists. Potential sources of contamination are isolated from the public water system by an air gap or an appropriate backflow prevention assembly in accordance with TNRCC regulations.	_____	_____
2. No cross-connection between the public drinking water supply and a private water system exists. Where an actual air gap is not maintained between the public water supply and a private water supply, an approved reduced pressure-zone backflow prevention assembly is properly installed and a service agreement exists for annual inspection and testing by a certified backflow prevention device tester	_____	_____
3. No connection exists which would allow the return of water used for condensing, cooling or industrial processes back to the public water supply.	_____	_____
4. No pipe or pipe fitting which contains more than 8.0 percent lead exists in Private water distribution facilities installed on or after July 1, 1988.	_____	_____
5. No solder or flux which contains more than 0.2 percent lead exists in private Water distribution facilities installed on or after July 1, 1988.	_____	_____

Water service shall not be provided or restored to the private water distribution facilities until the above conditions are determined to be in compliance. I further certify that the following materials were used in the installation of the private water distribution facilities:

Service Lines	Lead_____	Copper_____	PVC_____	Other_____
Solder	Lead_____	Lead Free_____	Solvent Weld_____	Other_____

I recognize that this document shall become a permanent record of the aforementioned Public Water System and that I am legally responsible for the validity of the information I have provided.

_____ Signature of Inspector	_____ Registration Number	_____ Date
_____ Title -- End of Section --	_____ Type of Registration	

Figure: 30 TAC §290.47(f)

Appendix F: Sample Backflow Prevention Assembly Test and Maintenance Report

The following form must be completed for each assembly tested. A signed and dated original must be submitted to the public water supplier for record keeping purposes:

BACKFLOW PREVENTION ASSEMBLY TEST AND MAINTENANCE REPORT

NAME OF PWS: _____
PWS I.D. # _____
MAILING ADDRESS _____
CONTACT PERSON _____
LOCATION OF SERVICE: _____

The backflow prevention assembly detailed below has been tested and maintained as required by TNRCC regulations and is certified to be operating within acceptable parameters.

TYPE OF ASSEMBLY

- | | |
|---|--|
| <input type="checkbox"/> Reduced Pressure Principal | <input type="checkbox"/> Reduced Pressure Principle-Detector |
| <input type="checkbox"/> Double Check Valve | <input type="checkbox"/> Double Check-Detector |
| <input type="checkbox"/> Pressure Vacuum Breaker | <input type="checkbox"/> Spill-Resistant Pressure Vacuum Breaker |

Manufacturer _____ Size _____
Model Number _____ Located At _____
Serial Number _____

Is the assembly installed in accordance with manufacturer recommendations and/or local codes? _____

Figure: 30 TAC §290.47(f)

	Reduced Pressure Principle Assembly			Pressure Vacuum Breaker	
	Double Check Valve Assembly				
	1st Check	2nd Check	Relief Valve	Air Inlet	Check Valve
Initial Test	Held at ____ psid Closed Tight <input type="checkbox"/> Leaked <input type="checkbox"/>	Held at ____ psid Closed Tight <input type="checkbox"/> Leaked <input type="checkbox"/>	Opened at ____ psid Did not open <input type="checkbox"/>	Opened at ____ psid Did not open <input type="checkbox"/>	Held at ____ psid Leaked <input type="checkbox"/>
Repairs and Materials Used					
Test After Repair	Held at ____ psid Closed Tight <input type="checkbox"/> Leaked <input type="checkbox"/>	Held at ____ psid Closed Tight <input type="checkbox"/> Leaked <input type="checkbox"/>	Opened at ____ psid	Opened at ____ psid	Held at ____ psid

Test gauge used: Make/Model _____ SN: _____ Calibration Date: _____

Remarks: _____

The above is certified to be true at the time of testing.

Firm Name _____ Certified Tester _____

Firm Address _____ Cert. Tester No. _____ Date _____

Firm Phone # _____

* TEST RECORDS MUST BE KEPT FOR AT LEAST THREE YEARS

** USE ONLY MANUFACTURER'S REPLACEMENT PARTS

SECTION 15487

VEHICLE MAINTENANCE EQUIPMENT

09/2000

AMENDMENT NO. 0005

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A ###	(19XX) Specification for Coating on Assembled Products
ASTM A 36	(1991) Structural Steel
ASTM A 53	(1990) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A 106	(1991) Seamless Carbon Steel Pipe for High-Temperature Service
ASTM B 88	(1992) Seamless Copper Water Tube
ASTM B 117	(1990) Salt Spray (Fog) Testing
ASTM D 1248	(1984; R 1989) Polyethylene Plastics Molding and Extrusion Materials
ASTM D 2485	(1991) Evaluating Coatings for High Temperature Service
ASTM D 4060	(1990) Abrasion Resistance of Organic Coatings by the Taber Abraser

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME-17	(1989; Addenda 1989, 1990, 1991) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications
ASME B16.22	(1989) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B31.1	(1992) Power Piping

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 30	(1987) Flammable and Combustible Liquids Code
---------	---

NFPA 30A (1987) Automotive and Marine Service
Stations Code

UNDERWRITERS LABORATORIES (UL)

Subject 2085 Outline of Investigation for Insulated
Aboveground Tanks for Flammable and
Combustible Liquids

UL 142 (1983; Rev Oct 988) Relocking Devices for
Safes and Vaults

UL 1709 (1989) Safety Rapid Rise Fire Tests of
Protection Materials for Structural Steel

1.2 GENERAL REQUIREMENTS

1.2.1 Standard Products

Materials and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products. Items of equipment shall essentially duplicate equipment that has been in satisfactory use at least 3 years prior to bid opening.

1.2.2 Verification of Dimensions

The Contractor shall become familiar with details of the work, verify dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

1.2.3 Code

All work shall be in accordance with NFPA 30 and NFPA 30A, unless otherwise stated.

1.2.4 Welding

Piping shall be welded in accordance with qualified procedures using performance-qualified welders and welding operators. Procedures and welders shall be qualified in accordance with ASME-17. Welding procedures qualified by others, and welders and welding operators qualified by another employer, may be accepted as permitted by ASME B31.1. The Contracting Officer shall be notified 24 hours in advance of tests, and the tests shall be performed at the work site if practicable. Welders or welding operators shall apply their assigned symbols near each weld they make as a permanent record. Structural members shall be welded in accordance with Section 05055 WELDING, STRUCTURAL.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Vehicle Maintenance Systems; [____], [____].

Detail drawings consisting of illustrations, schedules, performance charts, instructions, brochures, diagrams, and other information to illustrate the requirements and operations of each system. Detail drawings for the complete systems including piping layouts and locations of connections; dimensions for roughing-in, foundation, and support points; and schematic diagrams and wiring diagrams or connection and interconnection diagrams. Detail drawings shall indicate clearances required for maintenance and operation. Where piping and equipment are to be supported other than as indicated, details shall include loadings and proposed support methods.

Welding; [____], [____].

A copy of qualified procedures and a list of names and identification symbols of qualified welders and welding operators.

Notification; [____], [____].

Construction notification form (Appendix A of this specification section) shall be completed and mailed to the Texas Natural Resource Conservation Commission 30 days prior to start of construction. Six copies of the notification form shall be submitted to the contracting officer.

SD-06 TestReports

Tests and Flushing; [____], [____].

Test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, completion and testing of the installed system. Each test report shall indicate the final position of controls.

SD-07 Certificates

Materials and Equipment; [____], [____].

Where materials or equipment are specified to comply with requirements of AGA, or ASME, proof of such compliance. The label or listing of the specified agency will be acceptable evidence. In lieu of the label or listing, a written certificate may be submitted from an approved, nationally recognized testing organization equipped to perform such services, stating that the items have been tested and conform to the requirements and testing methods of the specified agency. Where equipment is specified to conform to requirements of the ASME Boiler and Pressure Vessel Code, the design, fabrication, and installation shall conform to the code.

Bolts; [____], [____], [____].

Written certification that the bolts furnished comply with the requirements of this specification, provided by the bolt manufacturer. The certification shall include illustrations of product-required markings, the date of manufacture, and the number

of each type of bolt to be furnished based on this certification.

SD-10 Operation and Maintenance Data

Vehicle Maintenance Systems; [____], [____].

Six copies of the operation manual outlining the step-by-step procedures required for system startup, operation and shutdown. The manual shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Six copies of the maintenance manual listing routine maintenance procedures, possible breakdowns and repairs. The manual shall include piping and equipment layout and simplified wiring and control diagrams of the system as installed.

SD-11 Closeout Submittals

Instructions, Vehicle Maintenance Systems; [____], [____].

Diagrams, instructions, and other sheets proposed for posting.

1.4 ELECTRICAL WORK

Electric motor-driven equipment specified herein shall be provided complete with motors. Equipment shall be rated at 60 Hz, single phase, ac unless otherwise indicated. Motors shall be open, drip proof type unless otherwise indicated. Where a motor controller is not provided in a motor-control center on the electrical drawings, a motor controller shall be provided with the mechanical equipment. Motors and motor controllers shall conform to the applicable requirements of Section 16415 ELECTRICAL WORK, INTERIOR. Electrical characteristics shall be as indicated. Motor controllers shall be provided complete with properly sized thermal-overload protection in each ungrounded conductor, auxiliary contact, and other equipment at the specified capacity including an allowable service factor, and other appurtenances necessary for the motor control specified. Manual or automatic control and protective or signal devices required for operation herein specified and any wiring required to such devices not shown on the electrical drawings shall be provided under this section. Complete electrical schematic lineless or full line interconnection and connection diagram for each piece of mechanical equipment having more than one automatic or manual electrical control device shall be submitted for approval.

PART 2 PRODUCTS

2.1 ANTI-FREEZE FLUID DISPENSING SYSTEM

2.1.1 Pump

Pump shall be 15mm female nominal pipe thread fluid inlet and outlet air-operated diaphragm pump, self-priming, single inlet/single outlet, with a pressure ratio of 1:1, and a capacity of 0.8 L/s at 0 kPa backpressure. Pump shall be provided with Buna "N" diaphragm, o-rings, and ball checks. Pump body shall be polypropylene. Provide wall bracket, filter/regulator, airline, suction, discharge hoses, couplers and connectors to match pump and fluid.

2.1.2 Siphon Tube Assembly

Adjustable PVC tube for use with 208.2 liter drum. Provide bung adapter, foot valve for positive priming and flexible siphon hose.

2.1.1.3 Hose Reel

Reel frames, spools, and base plate shall be manufactured of heavy gauge steel, with bronze self-lubricating bearing fitted to solid axle, replaceable spring type cartridge with motor spring and arbor, adjustable cast aluminum roller guide and arm, all brass swivel joint with double o-ring seals, flexible lead-in line (size shall be same as hose), and nylon hose rollers on solid steel pins.

2.1.3.1 Accessories

Provide all couplers, connectors and fittings to provide a complete hose reel package.

2.1.3.2 Dispense Valve and Hose

Provide 10 mm I.D. neoprene tube, 2-fabric braid, neoprene covered hose, 15.24 meter length, rubber hose stop and a maximum working pressure of 2069 kPa . Provide non-metered radiator bibb control handle with neoprene rubber spout, non-drip tip and a maximum working pressure of 2069 kPa .

2.1.4 Flexible Pump Connector Hose

Provide neoprene tube, neoprene cover, 2 fabric braid with 20 mm I.D. NPT end connections. Minimum working pressure shall be 2069 kPa . Length shall be 1800mm minimum.

2.1.5 Distribution Tubing and Fittings

2.1.5.1 Tube

Carbon steel soft annealed hydraulic tubing, ASTM A-179 or equivalent, Rockwell b hardness of 72 or less, free from scratches and suitable for bending and flaring. Size shall be 15.88mm O.D. with wall thickness of 0.89 mm . Tubing shall be suitable for working pressure of 2069 kPa .

2.1.5.2 Fittings

Carbon steel, high pressure fittings with threaded swage connections intended for use with the specified tubing and having pressure rating no less than the connecting tubing. Fittings will be primarily limited to adapter fittings when changing sizes, changing thread type, or when providing points of system disconnection (unions). Changes in direction shall be made by radius bends of 5 tubing diameters or more where possible. Tubing bends shall be made by an appropriate tube bending device.

2.1.5.3 Joints

High pressure screwed swage joints with unions at valves, specialties and disconnect points. Pressure ratings shall be the same as for fittings.

2.1.6 Valves

Full port ball valves, two-piece carbon steel body, reinforced teflon seat, rated at 4964 kPa .

2.1.7 Tubing Support

Tubing shall be supported by split body supports bolted to a mounting rail.

Support body shall be virgin polypropylene conforming exactly to the tube diameter. The support body shall be bolted securely between two clamping plates to a stainless steel mounting rail. All components of the support system including body, clamping plates, mounting rail, bolts, and nuts shall be supplied by one manufacturer and shall be designed to be used as a system. Supports spacing shall be one meter along the tubing route.

2.2 GEAR OIL (WT. 90), ENGINE OIL (WT. 50), AND TRANSMISSION FLUID (WT. 10) DISPENSING SYSTEMS

2.2.1 Pumps

Pump shall be 76.2 mm diameter air-operated motor, 57.15 mm stroke, double-action piston pump, with a pressure ratio of 5:1, and a capacity of 0.32 L/s free flow at 827 kPa inlet pressure. Pump body shall be constructed of steel or aluminum. Pump shall be furnished with a coupler, a connector, airline hose, air filter/regulator, material hose and bung adapter.

2.2.2 Pump Lift

Lift shall be single post, single acting air cylinder with channel plate to mount motor directly, with overall extension of 2337 mm , for 208.2 liter drum.

2.2.3 Hose Reel

Reel frames, spools, and base plate shall be manufactured of heavy gauge steel, with bronze self-lubricating bearing fitted to solid axle, replaceable spring type cartridge with motor spring and arbor, adjustable cast aluminum roller guide and arm, all brass swivel joint with double o-ring seals, flexible lead-in line (size shall be same as hose), and nylon hose rollers on solid steel pins.

2.2.3.1 Accessories

Provide all couplers, connectors and fittings to provide a complete hose reel package.

2.2.3.2 Dispense Valve and Hose

Provide 13 mm I.D. Buna "N" tube, 1-wire braid, neoprene covered hose, 15.24 meter length, rubber hose stop and a maximum working pressure of 6895 kPa . Provide pre-set metered control valve with face dial that registers increments in quarts, totalizing odometer registers increments in gallons, in-line filter assembly, fluid inlet, non-drip tip and a maximum working pressure of 6895 kPa .

2.2.4 Flexible Pump Connector Hose

Provide 13 mm Buna "N" tube, neoprene cover, 1-wire braid with 13 mm I.D. NPT end connections. Minimum working pressure shall be 6895 kPa . Length shall be 1800mm minimum.

2.2.5 Distribution Tubing and Fittings

a. Tube: Carbon steel soft annealed hydraulic tubing, ASTM A-179 or equivalent, Rockwell b hardness of 72 or less, free from scratches and suitable for bending and flaring. Size shall be 15.88 mm O.D. with wall thickness of 0.89 mm. Tubing shall be suitable for working pressure of 6895 kPa.

b. Fittings: Carbon steel, high pressure fittings with threaded swage connections intended for use with the specified tubing and having pressure rating no less than the connecting tubing. Fittings will be primarily limited to adapter fittings when changing sizes, changing thread type, or when providing points of system disconnection (unions). Changes in direction shall be made by radius bends of 5 tubing diameters or more where possible. Tubing bends shall be made by an appropriate tube bending device.

c. Joints: High pressure screwed swage joints with unions at valves, specialties and disconnect points. Pressure ratings shall be the same as for fittings.

2.2.6 Valves

Full port ball valves, two-piece carbon steel body, reinforced teflon seat, rated at 4964 kPa.

2.2.7 Tubing Support

Tubing support shall be same as for anti-freeze fluid dispensing system.

2.3 CHASSIS GREASE DISPENSING SYSTEM

2.3.1 Pump

Pump shall be 76.2 mm diameter air-operated motor, 57.15 mm stroke, double-action piston pump, with a pressure ratio of 50:1, and a capacity of 0.032 L/s free flow at 827 kPa inlet pressure. Pump body shall be constructed of steel or aluminum. Pump shall be furnished with a coupler, a connector, airline hose, air filter/regulator, material hose, drum cover, and follower plate.

2.3.2 Pump Lift

Lift shall be single post, single acting air cylinder with channel plate to mount motor directly, with overall extension of 2337 mm, for 208.2 liter drum. Lift shall be compatible with drum cover for pump.

2.3.3 Hose Reel

Reel frames, spools, and base plate shall be manufactured of heavy gauge steel, with bronze self-lubricating bearing fitted to solid axle, replaceable spring type cartridge with motor spring and arbor, adjustable cast aluminum roller guide and arm, all brass swivel joint with double o-ring seals, flexible lead-in line (size shall be same as hose), and nylon hose rollers on solid steel pins.

2.3.3.1 Accessories

Provide all couplers, connectors and fittings to provide a complete hose reel package.

2.3.3.2 Dispense Valve and Hose

Provide 10 mm I.D. Buna "N" tube, 2-wire braid, neoprene covered hose, 15.24 meter length, rubber hose stop and a maximum working pressure of 27,580 kPa . Provide high pressure control handle with inlet material filter and curved nozzle with hydraulic coupler and 10 mm (M) by 10 mm (F) "Z" type swivel with a maximum working pressure of 68,948 kPa .

2.3.4 Flexible Pump Connector Hose

Provide 13 mm Buna "N" tube, Buna "N" cover, 2-wire braid with 13 mm I.D. NPT end connections. Minimum working pressure shall be 34,474 kPa . Length shall be 1800 mm minimum.

2.3.5 Distribution Tubing and Fittings

2.3.5.1 Tube

Carbon steel soft annealed hydraulic tubing, ASTM A-179 or equivalent, Rockwell b hardness of 72 or less, free from scratches and suitable for bending and flaring. Size shall be 12.7 mm O.D. with wall thickness of 2.11 mm . Tubing shall be suitable for working pressure of 41,370 kPa .

2.3.5.2 Fittings

Carbon steel, high pressure fittings with threaded swage connections intended for use with the specified tubing and having pressure rating no less than the connecting tubing. Fittings will be primarily limited to adapter fittings when changing sizes, changing thread type, or when providing points of system disconnection (unions). Changes in direction shall be made by radius bends of 5 tubing diameters or more where possible. Tubing bends shall be made by an appropriate tube bending device.

2.3.5.3 Joints

High pressure screwed swage joints with unions at valves, specialties and disconnect points. Pressure ratings shall be the same as for fittings.

2.3.6 Valves

Stainless steel needle or block valve rated at 68,948 kPa working pressure.

2.3.7 Tubing Support

Tubing support shall be same as for anti-freeze fluid dispensing system.

2.4 COMPRESSED AIR DISPENSING SYSTEM

2.4.1 Hose Reel

Reel frames, spools, and base plate shall be manufactured of heavy gauge steel, with bronze self-lubricating bearing fitted to solid axle, replaceable spring type cartridge with motor spring and arbor, adjustable cast aluminum roller guide and arm, all brass swivel joint with double o-ring seals, flexible lead-in line (size shall be same as hose), and nylon hose rollers on solid steel pins.

2.4.2 Accessories

Provide all couplers, connectors and fittings to provide a complete hose reel package.

2.4.3 Dispense Valve and Hose

Provide 10 mm I.D. neoprene tube, 2-fabric braid, neoprene covered hose, 15.24 meter 50 foot length, rubber hose stop and a maximum working pressure of 2068 kPa . Provide tire inflator gauge with straight chuck, all weather cap and rubber sleeve, which registers from 22 kPa (15 psi) to 130 kPa (90 psi) in 1 kg increments. Provide coupler and connector.

2.4.4 Distribution Tubing and Fittings

2.4.4.1 Tube

Carbon steel soft annealed hydraulic tubing, ASTM A-179 or equivalent, Rockwell b hardness of 72 or less, free from scratches and suitable for bending and flaring. Size shall be 15.88 mm O.D. with wall thickness of 0.89 mm . Tubing shall be suitable for working pressure of 2069 kPa .

2.4.4.2 Fittings

Carbon steel, high pressure fittings with threaded swage connections intended for use with the specified tubing and having pressure rating no less than the connecting tubing. Fittings will be primarily limited to adapter fittings when changing sizes, changing thread type, or when providing points of system disconnection (unions). Changes in direction shall be made by radius bends of 5 tubing diameters or more where possible. Tubing bends shall be made by an appropriate tube bending device.

2.4.4.3 Joints

High pressure screwed swage joints with unions at valves, specialties and disconnect points. Pressure ratings shall be the same as for fittings.

2.4.5 Valves

Full port ball valves, two-piece carbon steel body, reinforced teflon seat, rated at 4964 kPa .

2.4.6 Tubing Support

Tubing Support shall be same as for anti-freeze fluid dispensing system.

2.5 WASTE OIL AND WASTE ANTI-FREEZE COLLECTION SYSTEMS

2.5.1 Rolling Drain Pan

1.9 liter capacity designed for installation across service pit with adjustable axis to fit pit from 990 mm to 1070 mm wide. Drain pan shall be constructed of 2.65 mm (12 gauge) steel with anti-splash baffles and grill. Provide with 50 mm one quarter turn ball valve quick disconnect couplers and nipple with cap and chain. Provide 80 mm NPT diameter wells and 50.8 mm steel angle track full length of pit on each side.

2.5.2 Drain Pan Evacuation Pump

Pump shall be 13 mm air-operated diaphragm pump, self-priming, single

inlet/single outlet, with a pressure ration of 1:1, and a capacity of 0.82 l/s . Pump shall be provided with Buna "N" diaphragm, o-rings, and ball checks. Pump body shall be polypropylene. Provide filter/regulator, airline hose, material hoses, coupler and connector to match pump.

2.5.3 Collection Sink

Self-rimming, 304.8mm by 304.8 mm by 109.5 mm , 1.195 mm (18 gauge) , type 302 stainless steel sink without faucet ledge.89 mm centered drain opening.

2.5.4 Collection Basin

Double wall basin fabricated from fiberglass reinforced plastic (RFP) or virgin High Density Polyethylene conforming to ASTM D 1248 for Polyolefin materials. Inner tank shall be seamless construction with back welded extensions and flanged top with bolted 9.4 mm thick bolt down cover. Outer tank shall be seamless construction with FRP outer layer and heavy-duty traffic weight cast iron cover and frame set flush with finished floor. Inlet, outlet and vent openings shall be as indicated on the drawings. Basins shall be provided with floatation protection in strict accordance with manufacturer's requirements. [Basins will be normally empty.] All materials shall be suitable for exposure to dilute fuel oil, engine oil, and ethylene glycol at ambient temperature of 23 degrees C . Inner tank size shall be 914.4 mm in diameter.

2.5.5 Pneumatic Liquid Level Sensor

Sensor shall produce output signal when sensing tube is blocked by liquid. Output signal shall be same pressure as pressure of supplied compressed air. When off, output shall be connected to atmosphere through exhaust port within the enclosure. Maximum operating pressure shall be 1034 kPa . Sensor shall include internal pressure regulator, filter, sensing tube and separate three-way pilot valve in compressed air supply to pump.

2.5.5.1 Pilot Valve

Three-way pilot valve, 6 mm NPTF ports, piped nonpassing or passing, pilot actuated, with internal spring assisted return. Single-O-ring seal shall be provided

2.5.6 Collection Basin Evacuation Pump

Pump shall be 25.4 mm air-operated diaphragm pump, self-priming, single inlet/single outlet, with a pressure ratio of 1:1, and a capacity of 2.17 l/s . Pump shall be provided with Buna "N" diaphragm, o-rings, and ball checks. Pump body shall be polypropylene. Provide wall bracket, filter/regulator, airline hose, coupler and connector to match pump.

2.5.7 Storage Tanks

2.5.7.1 Basic Material and Methods

Provide **3785 liter (1000 gallons) (AM#5)** aboveground concrete encased storage tanks factory fabricated, factory cast, and factory tested where indicated on the drawings of the size and capacity scheduled and as specified herein. The aboveground concrete encased storage tanks shall be steel tanks contained in concrete slabs. The entire concrete encased tank assembly shall be UL listed in accordance with UL Subject 2085.

2.5.7.2 Steel Tanks

- a. Manufactured and listed in accordance with UL 142 and have 4.8 mm thick ASTM A 36 steel skin;
- b. 152 mm diameter emergency vent as required by NFPA 30;
- c. Threaded tank openings except for secondary leak detector tube;
- d. Rectangular in shape and have continuous welds on all sides and bottom plates, inside as well as outside;
- e. Pressure tested at 34.5 kPa for 24 hours and in accordance with UL 142;
- f. Coated with rust resistant primer;
- g. Covered by 6.35 mm thick insulating spacer panels of polystyrene (or equal) which melts on contact with leaking petroleum products;
- h. Fabricated with 100 mm NPT threaded fill nipple, 26.5 liter (7 gallon) lockable internal overfill containment, secondary containment detector tube, threaded 100 mm NPT connection nipple, three threaded 50 mm NPT connection nipples, and one threaded 150 mm NPT emergency vent nipple;
- i. Internally braced at 450 mm on center maximum and shown to have a maximum deflection of 1.82 mm and a maximum stress of 62.3 MPa in the 4.8 mm thick skin at an internal pressure of 34.5 kPa. The secondary containment shall consist of a .76mm (30 mil.) polyethylene membrane enclosing the polystyrene spacer panels in a continuous manner to above the liquid level.

2.5.7.3 Concrete Vaults

- a. Encasement of the tanks and secondary containment consisting of 152.4 mm (minimum) of 20,680 kPa reinforced concrete (minimum);
- b. Structurally designed and shown to properly support the tank filled and a 4790 Pa top slab live load;
- c. Monolithic pour and contain no cold joints, heat sinks, or metallic penetrations on bottom and sides;
- d. Tested in accordance with UL 1709, and UL Subject 2085, and shown to have a two-hour fire rating;
- e. Capable of physical monitoring between primary and secondary containment;
- f. Precast and prefinished with two coats of fuel resistant coatings;
- g. Constructed in compliance with applicable ACI and AASHTO standards including reinforcement placement, bar bending, concrete placement, vibration, and quality assurance procedures;
- h. Utilize reinforcing steel which complies with ASTM A 615 grade 60 or ASTM A 706 grade 60 requirements.

Provide 1220 mm minimum length gauge sticks and calibrated charts

specific for tank installed. Gauge sticks and calibration charts shall be marked in both english and metric units.

2.5.8 Piping

2.5.8.1 Underground Containment Piping

Containment piping shall be double pipe system consisting of fiberglass (RTRP) carrier and containment pipe. Pipe, fittings, and adhesive shall be rated by UL to a pressure of 1034 kPa (minimum) and 100 degrees C . Pipe shall be fiberglass reinforced epoxy made by the filament winding process. Pipe shall contain a resin-rich liner with a minimum thickness of 0.38 mm .

Fittings shall be fiberglass reinforced epoxy made by the compression molding process. Fittings may be of two-piece construction which will be bonded together at final assembly. Design shall allow for unilateral expansion and contraction of carrier and containment pipes. Backfill method and material shall be in accordance with containment system manufacturer's recommendations.

2.5.8.1 2.5.8.2 Aboveground Piping

Schedule 40 black steel, ASTM A 53, butt welded pipe and malleable fittings.

2.5.9 Leak Detector

Leak detector system shall monitor double wall waste oil collection basin and piping system and double wall waste antifreeze collection basin and piping system. Electronic leak detection system shall provide continuous monitoring and consist of controller, sensing probes, and instrumentation cable. Controller shall be UL listed, 120 volts AC, with internal fuse to protect circuit board. Controller shall have operating temperature range of 0 to 50 degrees C . Controller shall be housed in hard metal case, 150 mm by 200 mm by 100 mm deep, with external flanges for wall mounting. Controller shall have visual indicators for dry, wet, and oil. Programmable audible alarm shall alarm on oil only or on oil/wet. Audible alarm shall be continuous for oil and pulsating for wet. Audible alarm shall be at least 75 db at 600 mm . Controller shall have push on/off audible alarm disable switch located on front panel. Controller shall have external press-to-test button which shall light visual indications on front panel and activate audible alarm to insure operation. Controller shall have internal dry contact, electromechanical relay capable of switching loads up to 120 volts AC, 6 amperes. Controller shall accept up to 16 remote annunciating probes wired in parallel with only one home run of wire. Controller shall accept mix of float fluid probes, stationary fluid probes, vapor probes, overfill probes, or any combination. Controller shall power probes up to 1200 meters from controller, dependent upon type and number of probes.

2.6 HIGH PRESSURE HOT WATER WASHER

Stationary packaged natural gas fired high pressure hot water washer mounted on rigid steel frame with bottom of unit 600 mm (minimum) above finished floor. Unit shall be with factory baked enamel finish and shall be factory fired and tested. Features shall include: precision solution/chemical metering valve; stainless steel solution tank (100 liters minimum) stainless steel make-up water tank; 4 kW (5 hp) pressure booster pump with internal thermal motor protection, Schedule 80 steel coil (ASTM A 53 close coiling); natural draft burner with electronic spark ignition and flame monitor; modulating thermostat low voltage control with capability to

control start/stop from any one of four remote stations (only one station to control or operate at any one time). For each of four stations provide a 10 mm I.D. by 12,200 mm steel braided, two-wire, oil and chemical resistant hose with trigger type shutoff gun and wand assembly and a wall mounted remote control station. Unit capacity shall be as scheduled on the drawings.

2.7 MAINTENANCE PIT CATCH BASIN

2.7.1 Pumps

Pump shall be 50.8 mm air-operated diaphragm pump, self-priming, single outlet, with a pressure ration of 1:1, and a capacity of 8.5 l/s . Pump shall be provided with Buna "N" diaphragm, o-rings and ball checks and manufactured screened inlet. Pump body shall be polypropylene, filter/regulator, coupler and connector to match pump.

2.7.2 Control Valve

Single seated, tight closing, float actuated bronze globe valve rated at 1034 kPa working pressure. Provide all bronze trim with minimum 175 mm diameter float.

2.7.3 Piping

2.7.3.1 Piping Below Floor

Type K - soft temper copper (ASTM B 88) continuous without joints in or under floors.

2.7.3.2 Piping Above Floor

Type K - hard temper copper (ASTM B 88) with brazed joints.

2.7.3.3 Fittings

Wrought copper and bronze solder-joint pressure fittings (ASME B16.22).

2.8 FLEXIBLE CONNECTORS

Flexible connectors shall be provided at the suction and discharge of each pump. Connectors shall be constructed of neoprene, rubber, or braided bronze, with 330 kg standard flanges. Flexible connectors shall be line size and suitable for the pressure and temperature of the intended service.

PART 3 EXECUTION

3.1 IDENTIFICATION SYSTEMS

3.1.1 Identification Tags

Identification tags made of brass, engraved laminated plastic, or engraved anodized aluminum, indicating service and valve number shall be installed on valves, except those valves installed on supplies at plumbing fixtures. Tags shall be 35 mm minimum diameter, and marking shall be stamped or engraved. Indentations shall be black, for reading clarity. Tags shall be attached to valves with No. 12 AWG, copper wire, chrome-plated beaded chain, or plastic straps designed for that purpose.

3.1.2 Color Coding

Color coding for piping identification shall be as specified in Section 09900 PAINTING, GENERAL.

3.2 ESCUTCHEONS

Escutcheons shall be provided at finished surfaces where bare or insulated piping, exposed to view, passes through floors, walls, or ceilings, except in boiler, utility, or equipment rooms. Escutcheons shall be fastened securely to pipe or pipe covering and shall be satin-finish, corrosion-resisting steel, polished chromium-plated zinc alloy, or polished chromium-plated copper alloy. Escutcheons shall be either one-piece or split-pattern, held in place by internal spring tension or setscrew.

3.3 PAINTING

Painting of pipes, hangers, supports, and other iron work, either in concealed spaces or exposed spaces, is specified in Section 09900 PAINTING, GENERAL.

3.4 TESTS AND FLUSHING

3.4.1 Vehicle Maintenance Systems

The vehicle maintenance systems shall be tested in accordance with NFPA standards.

3.4.2 Compressed Air Piping (Nonoil-Free)

Piping systems shall be filled with oil-free dry air or gaseous nitrogen to 1034 kPa and hold this pressure for 2 hours with no drop in pressure.

3.4.3 Defective Work

If inspection or test shows defects, such defective work or material shall be replaced or repaired as necessary and inspection and tests shall be repeated. Repairs to piping shall be made with new materials. No caulking of screwed joints or holes will be acceptable.

3.4.4 3.4.4 Operational Test

Upon completion of and prior to acceptance of the installation, the Contractor shall subject the vehicle maintenance systems to operating tests to demonstrate satisfactory functional and operational efficiency. Such operating tests shall include the following information in a report with conclusion as to the adequacy of the system:

- a. Time, date, and duration of test.
- b. Pressures at the most remote locations.
- c. Operation of each dispensing system, including pumps, lifts, control valves, metered dispensers.
- d. Operation of maintenance pit catch basin pumps.
- e. Operation of waste oil/antifreeze collection systems including drainpans, pumps, controls, piping systems, and leak detection system.

3.5 POSTED INSTRUCTIONS

Framed instructions under glass or in laminated plastic, including wiring and control diagrams showing the complete layout of the entire system, shall be posted where directed. Condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the system shall be prepared in typed form, framed as specified above for the wiring and control diagrams and posted beside the diagrams. The framed instructions shall be posted before acceptance testing of the systems.

3.6 3.6 APPENDICES

Appendix A

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION
UNDERGROUND & ABOVEGROUND STORAGE TANK
CONSTRUCTION NOTIFICATION FORM1. ____Underground Storage Tank (UST) ____Aboveground Storage Tank
(AST)2. ____Stage I____ Stage II (Vapor Recover) CARB order
#_____3. TYPE OF CONSTRUCTION: (Indicate all that apply)
____Installation ____Replacement ____Improvement
____Removal ____Abandonment ____Other (Specify) _____

4. FACILITY LOCATION INFORMATION:	5. OWNER INFORMATION:
Facility Name:_____	Owner:_____
Address/Location:_____	Representative:_____
(No P.O. Box)_____	Address:_____
County:_____City:_____	City/State/Zip:_____
Facility No.:_____	_____
Telephone:_____	
Telephone:_____	

6. CONSULTANT INFORMATION:	7. CONTRACTOR INFORMATION:
Company:_____	Company:_____
Representative:_____	Representative:_____
Address:_____	Address:_____
City/State/Zip:_____	City/State/Zip:_____
CRP#:_____ ILP#:_____	

8. GENERAL DESCRIPTION OF PROPOSED UST/AST ACTIVITY:

9. SCHEDULE/DATES FOR PROPOSED CONSTRUCTION:

10: SUBMITTED BY (Signature)

Title & Company:

| TNRCC STAFF USE ONLY

11. MAIL COMPLETED FORM TO: | Date Rec'd: _____

Texas Natural Resource |
Conservation Commission | Region: _____
Petroleum Storage Tank Division |
P.O. Box 13087 | Remarks: _____
Austin, Texas 78711-3087 |
| Tracking No.: _____
|
| Logged By: _____
| _____

-- End of Section --

SECTION 15995A

COMMISSIONING OF HVAC SYSTEMS

04/01

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Commissioning Team; [____], [____]

List of team members who will represent the Contractor in the pre-commissioning checks and functional performance testing, at least 2 weeks prior to the start of pre-commissioning checks. Proposed revision to the list, prior to the start of the impacted work.

Test Procedures; [____], [____]

Detailed procedures for pre-commissioning checks and functional performance tests, at least 4 weeks prior to the start of pre-commissioning checks.

Test Schedule; G, [____]

Schedule for pre-commissioning checks and functional performance tests, at least 2 weeks prior to the start of pre-commissioning checks.

SD-06 Test Reports

Test Reports; G, [____]

Completed pre-commissioning checklists and functional performance test checklists organized by system and by subsystem and submitted as one package. The results of failed tests shall be included along with a description of the corrective action taken.

1.2 SEQUENCING AND SCHEDULING

The work described in this Section shall begin only after all work required in related Sections, including Section 15950 HEATING, VENTILATING AND AIR CONDITIONING (HVAC) CONTROL SYSTEMS and Section 15990 TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS, has been successfully completed, and all test and inspection reports and operation and maintenance manuals required in these Sections have been submitted and approved. Seismic details shall be in accordance with Sections 13080 SEISMIC PROTECTION FOR MISCELLANEOUS

EQUIPMENT and 15070 SEISMIC PROTECTION FOR MECHANICAL EQUIPMENT [as indicated]

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 COMMISSIONING TEAM AND CHECKLISTS

The Contractor shall designate team members to participate in the pre-commissioning checks and the functional performance testing specified herein. In addition, the Government will be represented by a representative of the Contracting Officer, the Design Agent's Representative, and the Using Agency. The team members shall be as follows:

Designation	Function
Q	Contractor's Chief Quality Control Representative
M	Contractor's Mechanical Representative
E	Contractor's Electrical Representative
T	Contractor's Testing, Adjusting, and Balancing Representative
C	Contractor's Controls Representative
D	Design Agent's Representative
O	Contracting Officer's Representative
U	Using Agency's Representative

Each checklist shown in appendices A and B shall be completed by the commissioning team. Acceptance by each commissioning team member of each pre-commissioning checklist item shall be indicated by initials and date unless an "X" is shown indicating that participation by that individual is not required. Acceptance by each commissioning team member of each functional performance test checklist shall be indicated by signature and date.

3.2 TESTS

The pre-commissioning checks and functional performance tests shall be performed in a manner which essentially duplicates the checking, testing, and inspection methods established in the related Sections. Where checking, testing, and inspection methods are not specified in other Sections, methods shall be established which will provide the information required. Testing and verification required by this section shall be performed during the Commissioning phase. Requirements in related Sections are independent from the requirements of this Section and shall not be used to satisfy any of the requirements specified in this Section. The Contractor shall provide all materials, services, and labor required to perform the pre-commissioning checks and functional performance tests. A pre-commissioning check or functional performance test shall be aborted if any system deficiency prevents the successful completion of the test or if any participating non-Government commissioning team member of which participation is specified is not present for the test. The Contractor shall reimburse the Government for all costs associated with effort lost due to tests that are aborted. These costs shall include salary, travel costs and per diem (where applicable) for Government commissioning team members.

3.2.1 Pre-Commissioning Checks

Pre-commissioning checks shall be performed for the items indicated on the checklists in Appendix A. Deficiencies discovered during these checks shall be corrected and retested in accordance with the applicable contract requirements.

3.2.2 Functional Performance Tests

Functional performance tests shall be performed for the items indicated on the checklists in Appendix B. Functional performance tests shall begin only after all pre-commissioning checks have been successfully completed. Tests shall prove all modes of the sequences of operation, and shall verify all other relevant contract requirements. Tests shall begin with equipment or components and shall progress through subsystems to complete systems. Upon failure of any functional performance test checklist item, the Contractor shall correct all deficiencies in accordance with the applicable contract requirements. The checklist shall then be repeated until it has been completed with no errors.

APPENDIX A

PRE-COMMISSIONING CHECKLISTS

Pre-commissioning checklist - Piping

For [_____] Piping System

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Piping complete.	___	___	X	___	X	___	___	___
b. As-built shop drawings submitted.	___	___	X	___	X	___	___	___
c. Piping flushed and cleaned.	___	___	X	___	X	___	___	___
d. Strainers cleaned.	___	___	X	___	X	___	___	___
e. Valves installed as required.	___	___	X	___	X	___	___	___
f. Piping insulated as required.	___	___	X	___	X	___	___	___
g. Thermometers and gauges installed as required.	___	___	X	___	X	___	___	___
h. Verify operation of valves.	___	___	X	___	___	___	___	___
i. Air vents installed as specified.	___	___	X	X	X	___	___	___
j. Flexible connectors installed as specified	___	___	X	X	X	___	___	___
k. Verify that piping has been labeled and valves identified as specified.	___	___	X	___	___	___	___	___
Testing, Adjusting, and Balancing (TAB)								
a. Hydrostatic test complete.	___	___	X	___	X	___	___	___
b. TAB operation complete.	___	___	X	___	___	___	___	___

Pre-commissioning Checklist - Ductwork

For Air Handler: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Ductwork complete.	___	___	X	___	X	___	___	___
b. As-built shop drawings submitted.	___	___	X	___	X	___	___	___
c. Ductwork leak test complete.	___	___	X	___	X	___	___	___
NOTE: The first bracketed item d will be used for Army projects, the second for Air Force projects.								
[d. Fire dampers, smoke dampers, and access doors installed as required.	___	___	X	___	X	___	___	___]
[d. Fire dampers, smoke dampers, and access doors installed as required with installation of each verified by the specified team members initialing each location on a copy of the as-built drawings.	___	___	X	___	X	___	___	___]
e. Ductwork insulated as required.	___	___	X	___	X	___	___	___
f. Thermometers and gauges installed as required.	___	___	___	___	___	___	___	___
g. Verify open/closed status of dampers.	___	___	X	___	X	___	___	___
h. Verify smoke dampers operation.	___	___	X	___	___	___	___	___
i. Flexible connectors installed as specified	___	___	X	___	X	___	___	___
Testing, Adjusting, and Balancing (TAB)								
a. TAB operation complete.	___	___	X	___	X	___	___	___

Pre-commissioning Checklist - Multizone Air Handling Unit

For Air Handling Unit: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
----------------	---	---	---	---	---	---	---	---

Installation

- | | | | | | | | | |
|--|-----|-----|---|-----|---|-----|-----|-----|
| a. Vibration isolation devices installed [and freed to float with adequate movement and seismic restraint] as specified. | ___ | ___ | X | X | X | ___ | ___ | ___ |
| b. Inspection and access doors are operable and sealed. | ___ | ___ | X | ___ | X | ___ | ___ | ___ |
| c. Casing undamaged. | ___ | ___ | X | X | X | ___ | ___ | ___ |
| d. Insulation undamaged. | ___ | ___ | X | X | X | ___ | ___ | ___ |
| e. Condensate drainage is unobstructed.
(Visually verify pan drains completely by pouring a cup of water into drain pan.) | ___ | ___ | X | X | X | ___ | ___ | ___ |
| f. Fan belt adjusted. | ___ | ___ | X | ___ | X | ___ | ___ | ___ |
| g. Manufacturer's required maintenance clearance provided. | ___ | ___ | X | X | X | ___ | ___ | ___ |

Electrical

- | | | | | | | | | |
|--|-----|-----|-----|-----|-----|-----|-----|-----|
| a. Power available to unit disconnect. | ___ | ___ | ___ | X | ___ | ___ | ___ | ___ |
| b. Power available to unit control panel. | ___ | ___ | ___ | X | ___ | ___ | ___ | ___ |
| c. Proper motor rotation verified. | ___ | ___ | ___ | ___ | X | ___ | ___ | ___ |
| d. Verify that power disconnect is located within sight of the unit it controls. | ___ | ___ | ___ | X | ___ | ___ | ___ | ___ |
| [e. Power available to electric heating coil.] | ___ | ___ | ___ | X | ___ | ___ | ___ | ___ |

Coils

- | | | | | | | | | |
|--|-----|-----|---|---|---|-----|-----|-----|
| [a. Chilled water piping properly connected.] | ___ | ___ | X | X | X | ___ | ___ | ___ |
| [a. Refrigerant piping properly connected.] | ___ | ___ | X | X | X | ___ | ___ | ___ |
| [b. Chilled water piping pressure tested.] | ___ | ___ | X | X | X | ___ | ___ | ___ |
| [b. Refrigerant piping pressure tested.] | ___ | ___ | X | X | X | ___ | ___ | ___ |
| [c. Hot water piping properly connected.] | ___ | ___ | X | X | X | ___ | ___ | ___ |
| [c. Steam and condensate piping properly connected.] | ___ | ___ | X | X | X | ___ | ___ | ___ |
| [d. Hot water piping pressure tested.] | ___ | ___ | X | X | X | ___ | ___ | ___ |

Pre-commissioning Checklist - Multizone Air Handling Unit

For Air Handling Unit: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
[d. Steam and condensate piping pressure tested.	___	___	X	X	X	___	___	___]
e. Air vents installed on water coils [with shutoff valves] as specified.	___	___	X	X	X	___	___	___
f. Any damage to coil fins has been repaired	___	___	X	___	X	___	___	___

Controls

a. Control valves/actuators properly installed.	___	___	X	___	___	___	___	___
b. Control valves/actuators operable.	___	___	X	___	___	___	___	___
c. O.A. dampers/actuators properly installed.	___	___	X	___	___	___	___	___
d. O.A. dampers/actuators operable.	___	___	X	___	___	___	___	___
e. Zone dampers/actuators properly installed.	___	___	X	___	___	___	___	___
f. Zone dampers/actuators operable.	___	___	X	___	___	___	___	___

Testing, Adjusting, and Balancing (TAB)

a. Construction filters removed and replaced.	___	___	X	___	X	___	___	___
b. TAB report submitted.	___	___	X	___	X	___	___	___
c. TAB results within +10%/-0% of L/s shown on drawings	___	___	___	___	___	___	___	___
d. TAB results for outside air intake within +10%/-0% of L/s shown on drawings.	___	___	X	___	X	___	___	___

Pre-commissioning Checklist - Variable Volume Air Handling Unit

For Air Handling Unit: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Vibration isolation devices installed.	___	___	X	X	X	___	___	___
b. Inspection and access doors are operable and sealed.	___	___	X	___	X	___	___	___
c. Casing undamaged.	___	___	X	X	X	___	___	___
d. Insulation undamaged.	___	___	X	X	X	___	___	___
e. Condensate drainage is unobstructed. (Visually verify drainage by pouring a cup of water into drain pan.)	___	___	X	X	X	___	___	___
f. Fan belt adjusted.	___	___	X	___	X	___	___	___
g. Manufacturer's required maintenance clearance provided.	___	___	X	X	X	___	___	___
Electrical								
a. Power available to unit disconnect.	___	___	___	X	X	___	___	___
b. Power available to unit control panel.	___	___	___	X	___	___	___	___
c. Proper motor rotation verified.	___	___	___	___	X	___	___	___
d. Verify that power disconnect is located within sight of the unit it controls.	___	___	___	X	___	___	___	___
[e. Power available to electric heating coil.]	___	___	___	X	X	___	___	___
Coils								
[a. Chilled water piping properly connected.]	___	___	X	X	X	___	___	___
[a. Refrigerant piping properly connected.]	___	___	X	X	X	___	___	___
[b. Chilled water piping pressure tested.]	___	___	X	X	X	___	___	___
[b. Refrigerant piping pressure tested.]	___	___	X	X	X	___	___	___
[c. Hot water piping properly connected.]	___	___	X	X	X	___	___	___
[c. Steam and condensate piping properly connected.]	___	___	X	X	X	___	___	___
[d. Hot water piping pressure tested.]	___	___	X	X	X	___	___	___
[d. Steam and condensate piping pressure tested.]	___	___	X	X	X	___	___	___

Pre-commissioning Checklist - Variable Volume Air Handling Unit

For Air Handling Unit: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
[e. Air vents installed on water coils [with shutoff valves] as specified.	___	___	X	X	X	___	___	___
f. Any damage to coil fins has been repaired.	___	___	X	___	X	___	___	___

Controls

a. Control valves/actuators properly installed.	___	___	X	___	___	___	___	___
b. Control valves/actuators operable.	___	___	X	___	___	___	___	___
c. Dampers/actuators properly installed.	___	___	X	___	___	___	___	___
d. Dampers/actuators operable.	___	___	X	___	___	___	___	___
e. Verify proper location, installation and calibration of duct static pressure sensor.	___	___	X	___	___	___	___	___
f. Fan air volume controller operable.	___	___	X	___	___	___	___	___
g. Air handler controls system operational.	___	___	X	___	___	___	___	___

Testing, Adjusting, and Balancing (TAB)

a. Construction filters removed and replaced.	___	___	X	___	___	___	___	___
b. TAB report submitted.	___	___	X	___	X	___	___	___
c. TAB results within +10%/-0% of L/s shown on drawings	___	___	___	___	___	___	___	___
d. TAB results for outside air intake within +10%/-0% of both the minimum and maximum L/s shown on drawings.	___	___	X	___	X	___	___	___

Pre-commissioning Checklist - VAV Terminal

For VAV Terminal: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. VAV terminal in place.	___	___	X	X	X	___	___	___
b. VAV terminal ducted.	___	___	X	X	X	___	___	___
c. VAV terminal connected to controls.	___	___	X	X	___	___	___	___
[d. Reheat coil connected to hot water pipe.	___	___	X	___	X	___	___	___]
[e. Electric reheat coil connected to local disconnect.	___	___	___	___	X	___	___	___]
f. Manufacturer's required maintenance clearance provided.	___	___	X	X	X	___	___	___
Controls								
a. Cooling only VAV terminal controls set.	___	___	X	X	___	___	___	___
b. Cooling only VAV controls verified.	___	___	X	X	___	___	___	___
c. Reheat VAV terminal controls set.	___	___	X	X	___	___	___	___
d. Reheat terminal/coil controls verified.	___	___	X	X	___	___	___	___
Testing, Adjusting, and Balancing (TAB)								
a. Verify terminal maximum air flow set.	___	___	X	___	___	___	___	___
b. Verify terminal minimum air flow set.	___	___	X	___	___	___	___	___
c. TAB operation complete.	___	___	X	___	X	___	___	___

Pre-commissioning Checklist - DX Air Cooled Condensing Unit

For Condensing Unit: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation	___	___	X	X	X	___	___	___
b. Refrigerant pipe leak tested.	___	___	X	X	X	___	___	___
c. Refrigerant pipe evacuated and charged in accordance with manufacturer's instructions.	___	___	X	X	X	___	___	___
d. Check condenser fans for proper rotation.	___	___	X	___	X	___	___	___
e. Any damage to coil fins has been repaired.	___	___	X	___	X	___	___	___
f. Manufacturer's required maintenance/ operational clearance provided.	___	___	X	X	X	___	___	___
Electrical								
a. Power available to unit disconnect.	___	___	___	X	X	___	___	___
b. Power available to unit control panel.	___	___	___	X	___	___	___	___
c. Verify that power disconnect is located within sight of the unit it controls	___	___	___	X	___	___	___	___
Controls								
a. Unit safety/protection devices tested.	___	___	X	X	___	___	___	___
b. Control system and interlocks installed.	___	___	X	X	___	___	___	___
c. Control system and interlocks operational.	___	___	X	X	___	___	___	___

Pre-commissioning Checklist - Pumps

For Pump: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Pumps grouted in place.	___	___	X	X	X	___	___	___
b. Pump vibration isolation devices functional.	___	___	X	X	X	___	___	___
c. Pump/motor coupling alignment verified.	___	___	X	X	X	___	___	___
d. Piping system installed.	___	___	X	X	X	___	___	___
e. Piping system pressure tested.	___	___	X	X	X	___	___	___
f. Pump not leaking.	___	___	X	X	X	___	___	___
g. Field assembled couplings aligned to meet manufacturer's prescribed tolerances. _____			X	X	X	___	___	___
Electrical								
a. Power available to pump disconnect.	___	___	___	X	X	___	___	___
b. Pump rotation verified.	___	___	___	X	X	___	___	___
c. Control system interlocks functional.	___	___	___	X	___	___	___	___
d. Verify that power disconnect is located within sight of the unit it controls.	___	___	___	X	___	___	___	___
Testing, Adjusting, and Balancing (TAB)								
a. Pressure/temperature gauges installed.	___	___	X	___	X	___	___	___
b. Piping system cleaned.	___	___	X	X	X	___	___	___
c. Chemical water treatment complete.	___	___	X	X	X	___	___	___
d. Water balance complete.	___	___	X	___	X	___	___	___
e. Water balance with design maximum flow.	___	___	X	___	X	___	___	___
f. TAB Report submitted.	___	___	X	___	X	___	___	___

Pre-commissioning Checklist - Packaged Air Cooled Chiller

For Chiller: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Chiller properly piped.	___	___	X	___	___	___	___	___
b. Chilled water pipe leak tested.	___	___	X	X	X	___	___	___
c. Verify that refrigerant used complies with specified requirements.	___	___	X	X	X	___	___	___
d. Any damage to coil fins has been repaired.	___	___	X	___	X	___	___	___
e. Manufacturer's required maintenance clearance provided.	___	___	X	X	X	___	___	___
Electrical								
a. Power available to unit disconnect.	___	___	___	X	___	___	___	___
b. Power available to unit control panel.	___	___	___	X	___	___	___	___
c. Separate power is supplied to electric heating tape.	___	___	___	X	___	___	___	___
d. Verify that power disconnect is located within sight of the unit it controls.	___	___	___	X	___	___	___	___
Controls								
a. Factory startup and checkout complete.	___	___	X	X	___	___	___	___
b. Chiller safety/protection devices tested.	___	___	X	X	___	___	___	___
c. Chilled water flow switch installed.	___	___	X	X	___	___	___	___
d. Chilled water flow switch tested.	___	___	X	X	___	___	___	___
e. Chilled water pump interlock installed.	___	___	X	X	X	___	___	___
f. Chilled water pump interlock tested.	___	___	___	X	___	___	___	___

Pre-commissioning Checklist - Centrifugal Chiller

For Chiller: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Chilled water connections properly piped.	___	___	X	___	___	___	___	___
b. Condenser water connections properly piped	___	___	X	___	___	___	___	___
c. Chilled water pipe leak tested.	___	___	X	X	X	___	___	___
d. Condenser water pipe leak tested.	___	___	X	X	X	___	___	___
e. High efficiency purge unit installed and operating as specified.	___	___	X	X	X	___	___	___
f. Refrigerant leak detector installed.	___	___	___	___	___	___	___	___
g. Oxygen sensor installed and tested.	___	___	___	___	___	___	___	___
h. Mechanical room ventilation installed as specified.	___	___	___	___	___	___	___	___
i. Manufacturer's required maintenance clearance provided.	___	___	X	X	___	___	___	___
j. Field assembled couplings aligned to meet manufacturer's prescribed tolerances.	___	___	X	X	X	___	___	___
Electrical								
a. Power available to unit starter.	___	___	___	X	___	___	___	___
b. Power available to unit control panel.	___	___	___	X	___	___	___	___
c. Verify that power disconnect is located within sight of the unit it controls.	___	___	___	X	___	___	___	___
Controls								
a. Factory startup and checkout complete.	___	___	X	X	___	___	___	___
b. Chiller safety/protection devices tested.	___	___	___	X	___	___	___	___
c. Chilled water flow switch installed.	___	___	X	X	___	___	___	___
d. Chilled water flow switch tested.	___	___	X	X	___	___	___	___
e. Chilled water pump interlock installed.	___	___	___	X	___	___	___	___
f. Chilled water pump interlock tested.	___	___	___	X	___	___	___	___
g. Condenser water flow switch installed.	___	___	X	___	___	___	___	___
h. Condenser water flow switch tested.	___	___	___	X	___	___	___	___

Pre-commissioning Checklist - Centrifugal Chiller

For Chiller: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
i. Condenser water pump interlock installed.	___	___	___	X	___	___	___	___
j. Condenser water pump interlock tested.	___	___	___	X	___	___	___	___

Pre-commissioning Checklist - Cooling Tower

For Cooling Tower: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Cooling tower in place.	___	___	X	___	___	___	___	___
b. Cooling tower piped.	___	___	X	X	___	___	___	___
c. Cooling tower fan drive adjusted.	___	___	___	___	X	___	___	___
d. Cooling tower makeup water supply piped.	___	___	X	X	___	___	___	___
e. Verify makeup control valve shutoff.	___	___	X	___	X	___	___	___
f. Fan lubricated and blade pitch adjusted.	___	___	X	___	X	___	___	___
g. Manufacturer's required maintenance/ operational clearance provided.	___	___	X	X	X	___	___	___
Electrical								
a. Power available to tower disconnect.	___	___	___	X	___	___	___	___
b. Power available to electric sump heater.	___	___	___	X	___	___	___	___
c. Control system interlocks functional.	___	___	___	X	___	___	___	___
d. Motor and fan rotation checked.	___	___	___	X	___	___	___	___
e. Verify that power disconnect is located within sight of the unit is controls.	___	___	___	X	___	___	___	___
Piping								
a. Tower basin is clean and filled.	___	___	X	X	X	___	___	___
b. Condenser water treatment functional.	___	___	X	X	X	___	___	___
c. Water balance with design flow verified.	___	___	X	___	X	___	___	___
d. Water distribution headers balanced.	___	___	X	___	X	___	___	___

Pre-commissioning Checklist - Hot Water Boiler

For Boiler: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Boiler flue installed.	___	___	X	___	___	___	___	___
b. Boiler hot water piping installed.	___	___	X	___	___	___	___	___
c. Boiler hot water piping tested.	___	___	X	X	___	___	___	___
d. Boiler makeup water piping installed.	___	___	X	___	___	___	___	___
e. Boiler fuel oil piping installed.	___	___	X	X	X	___	___	___
f. Boiler fuel oil piping tested.	___	___	X	X	X	___	___	___
g. Boiler gas piping installed.	___	___	X	X	X	___	___	___
h. Boiler gas piping tested.	___	___	X	X	X	___	___	___
i. Manufacturer's required maintenance clearance provided.	___	___	X	___	___	___	___	___
Startup								
a. Boiler system cleaned and filled with treated water.	___	___	X	___	___	___	___	___
b. Boiler safety/protection devices, including high temperature burner shut-off, low water cutoff, flame failure, pre and post purge, have been tested.	___	___	___	X	___	___	___	___
c. Verify that PRV rating conforms to boiler rating.	___	___	___	X	___	___	___	___
d. Boiler water treatment system functional.	___	___	X	X	___	___	___	___
e. Boiler startup and checkout complete.	___	___	X	X	___	___	___	___
f. Combustion efficiency demonstrated.	___	___	X	___	X	___	___	___
Electrical								
a. Verify that power disconnect is located within sight of the unit served.	___	___	___	X	___	___	___	___
Controls								
a. Hot water pump interlock installed.	___	___	___	X	___	___	___	___
b. Hot water pump interlock tested.	___	___	___	X	___	___	___	___
c. Hot water heating system balanced.	___	___	X	X	___	___	___	___

Pre-commissioning Checklist - Hot Water Boiler

For Boiler: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
d. Hot water heating controls operational.	___	___	X	X	___	___	___	___

Pre-commissioning Checklist - Steam Boiler

For Boiler: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Boiler flue installed.	___	___	X	X	X	___	___	___
b. Boiler steam piping installed.	___	___	X	X	X	___	___	___
c. Boiler steam piping tested.	___	___	X	X	X	___	___	___
d. Boiler makeup water piping installed.	___	___	X	___	X	___	___	___
e. Boiler makeup water piping tested.	___	___	X	X	X	___	___	___
f. Boiler fuel oil piping installed.	___	___	X	X	X	___	___	___
g. Boiler fuel oil piping tested.	___	___	X	X	X	___	___	___
h. Boiler gas piping installed.	___	___	X	X	X	___	___	___
i. Boiler gas piping tested.	___	___	X	X	X	___	___	___
j. Manufacturer's required maintenance clearance provided.	___	___	X	X	X	___	___	___
Startup								
a. Boiler system cleaned and filled with treated water.	___	___	X	X	X	___	___	___
b. Boiler safety/protection devices, including high temperature burner shut-off, low water cutoff, flame failure, pre and post purge, have been tested.	___	___	___	X	___	___	___	___
c. Verify that PRV rating conforms to boiler rating.	___	___	___	X	___	___	___	___
d. Boiler feed water system operational.	___	___	___	X	___	___	___	___
e. Boiler water treatment system functional.	___	___	X	X	X	___	___	___
f. Boiler startup and checkout complete.	___	___	___	X	___	___	___	___
g. All steam traps operational.	___	___	X	X	X	___	___	___
h. All condensate return pumps operational.	___	___	___	___	X	___	___	___
i. Combustion efficiency demonstrated.	___	___	X	___	X	___	___	___
Electrical								
a. Verify that power disconnect is located within sight of the unit served.	___	___	___	X	___	___	___	___

Pre-commissioning Checklist - Steam/Hot Water Converter

For Converter: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Converter steam piping installed.	___	___	X	___	X	___	___	___
b. Converter steam piping tested.	___	___	X	X	X	___	___	___
c. Hot water piping installed.	___	___	X	___	___	___	___	___
d. Hot water piping tested.	___	___	X	X	X	___	___	___
e. Makeup water piping installed.	___	___	X	X	X	___	___	___
f. Vacuum breaker installed on shell of shell and tube unit.	___	___	X	X	X	___	___	___
g. Air vent installed as specified.	___	___	X	X	X	___	___	___
h. Manufacturer's required maintenance clearance provided.	___	___	X	X	X	___	___	___
Startup								
a. Hot water system cleaned and filled.	___	___	X	X	X	___	___	___
b. All steam traps operational.	___	___	X	X	X	___	___	___
c. All condensate return pumps operational.	___	___	___	X	___	___	___	___
d. Converter safety/protection devices tested.	___	___	X	X	X	___	___	___
e. Converter startup and checkout complete.	___	___	X	X	X	___	___	___
Controls								
a. Control valves/actuators properly installed.	___	___	X	___	___	___	___	___
b. Control valves/actuators operable.	___	___	X	___	___	___	___	___

Pre-commissioning Checklist - Fan Coil Unit

For Fan Coil Unit: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Vibration isolation devices installed.	___	___	X	X	X	___	___	___
b. Access doors/removable panels are operable and sealed.	___	___	X	___	X	___	___	___
c. Casing undamaged.	___	___	X	X	X	___	___	___
d. Insulation undamaged.	___	___	X	X	X	___	___	___
e. Condensate drainage is unobstructed.	___	___	X	X	X	___	___	___
f. Fan belt adjusted.	___	___	X	___	X	___	___	___
g. Any damage to coil fins has been repaired.	___	___	X	___	X	___	___	___
h. Manufacturer's required maintenance clearance provided.	___	___	X	X	X	___	___	___
Electrical								
a. Power available to unit disconnect.	___	___	___	X	___	___	___	___
b. Power available to unit control panel.	___	___	___	X	___	___	___	___
c. Proper motor rotation verified.	___	___	___	___	X	___	___	___
d. Verify that power disconnect is located within sight of the unit it controls.	___	___	___	X	___	___	___	___
[e. Power available to electric heating coil.	___	___	___	X	X	___	___	___]
Coils								
[a. Dual temperature piping properly connected.	___	___	X	___	___	___	___	___]
[a. Chilled water piping properly connected.	___	___	X	X	X	___	___	___]
[b. Dual temperature piping pressure tested.	___	___	X	___	___	___	___	___]
[b. Chilled water piping pressure tested.	___	___	X	X	X	___	___	___]
[c. Hot water piping properly connected.	___	___	X	___	___	___	___	___]
[d. Hot water piping pressure tested.	___	___	X	___	___	___	___	___]
Controls								
a. Control valves/actuators properly installed.	___	___	X	___	___	___	___	___

Pre-commissioning Checklist - Fan Coil Unit

For Fan Coil Unit: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
b. Control valves/actuators operable.	___	___	X	X	___	___	___	___
c. Verify proper location and installation of thermostat.	___	___	X	___	___	___	___	___
Testing, Adjusting, and Balancing (TAB)								
a. Construction filters removed and replaced.	___	___	X	___	___	___	___	___
b. TAB results +10%/-0% of L/s shown on drawings								
c. TAB Report submitted.	___	___	X	___	X	___	___	___

Pre-commissioning Checklist - Unit Heater

For Unit Heater: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
[a. Hot water piping properly connected.	___	___	X	___	___	___	___	___]
[a. Steam and condensate piping properly connected.	___	___	X	X	X	___	___	___]
[b. Hot water piping pressure tested.	___	___	X	___	___	___	___	___]
[b. Steam and condensate piping pressure tested.	___	___	X	X	X	___	___	___]
c. Air vent installed on hot water coil with shutoff valve as specified.	___	___	X	X	X	___	___	___
d. Any damage to coil fins has been repaired.	___	___	X	___	X	___	___	___
e. Manufacturer's required maintenance/operational clearance provided.	___	___	X	X	X	___	___	___
Electrical								
a. Power available to unit disconnect.	___	___	___	X	___	___	___	___
b. Proper motor rotation verified.	___	___	___	X	X	___	___	___
c. Verify that power disconnect is located within sight of the unit it controls.	___	___	___	X	___	___	___	___
d. Power available to electric heating coil.	___	___	___	X	___	___	___	___
Controls								
a. Control valves properly installed.	___	___	X	___	___	___	___	___
b. Control valves operable.	___	___	X	X	___	___	___	___
c. Verify proper location and installation of thermostat.	___	___	X	___	___	___	___	___
Testing, Adjusting, and Balancing (TAB)								
a. TAB Report submitted.	___	___	X	___	X	___	___	___

Pre-commissioning Checklist - Exhaust Fan

For Exhaust Fan: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Fan belt adjusted.	___	___	X	___	X	___	___	___
Electrical								
a. Power available to fan disconnect.	___	___	___	X	___	___	___	___
b. Proper motor rotation verified.	___	___	___	___	X	___	___	___
c. Verify that power disconnect is located within sight of the unit it controls.	___	___	___	X	___	___	___	___
Controls								
a. Control interlocks properly installed.	___	___	___	X	___	___	___	___
b. Control interlocks operable.	___	___	___	X	___	___	___	___
c. Dampers/actuators properly installed.	___	___	X	___	___	___	___	___
d. Dampers/actuators operable.	___	___	X	___	___	___	___	___
e. Verify proper location and installation of thermostat.	___	___	X	___	___	___	___	___
Testing, Adjusting, and Balancing (TAB)								
a. TAB results +10%/-0% to L/s shown on drawings	___	___	X	___	X	___	___	___
b. TAB Report submitted.	___	___	X	___	X	___	___	___

Pre-commissioning Checklist - Computer Room Unit

For Computer Room Unit: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Unit properly supported.	___	___	X	X	X	___	___	___
b. Access doors are operable and sealed.	___	___	X	___	X	___	___	___
c. Casing undamaged.	___	___	X	X	X	___	___	___
d. Insulation undamaged.	___	___	X	X	X	___	___	___
e. Condensate drainage is unobstructed and routed to floor drain.	___	___	X	X	X	___	___	___
f. Fan belt adjusted.	___	___	X	___	X	___	___	___
g. Manufacturer's required maintenance operational clearance provided.	___	___	X	X	X	___	___	___
Electrical								
a. Power available to unit disconnect.	___	___	___	X	X	___	___	___
b. Proper motor rotation verified.	___	___	___	___	X	___	___	___
c. Proper motor rotation verified.	___	___	___	___	X	___	___	___
d. Verify that power disconnect is located within sight of the unit it controls.	___	___	___	X	___	___	___	___
[e. Power available to reheat coils.	___	___	___	___	X	___	___	___]
Coils/Humidifier								
[a. Chilled water piping properly connected.	___	___	X	___	___	___	___	___]
[a. Refrigerant piping properly connected.	___	___	X	X	X	___	___	___]
[b. Chilled water piping pressure tested.	___	___	X	X	X	___	___	___]
[b. Refrigerant piping pressure tested.	___	___	X	X	X	___	___	___]
[c. Hot water piping properly connected.	___	___	X	___	___	___	___	___]
[c. Steam piping properly connected.	___	___	X	X	X	___	___	___]
[d. Hot water piping pressure tested.	___	___	X	X	___	___	___	___]
[d. Steam piping pressure tested.	___	___	X	X	X	___	___	___]
e. Humidifier makeup water connected.	___	___	X	X	X	___	___	___
Controls								

Pre-commissioning Checklist - Computer Room Unit

For Computer Room Unit: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
a. Control valves operable.	___	___	X	X	___	___	___	___
b. Unit control system operable and verified.	___	___	___	X	___	___	___	___
c. Verify proper location and installation of thermostat.	___	___	X	___	___	___	___	___
Testing, Adjusting, and Balancing (TAB)								
a. Construction filters removed and replaced.	___	___	X	___	X	___	___	___
b. TAB results +10%/-0% L/s shown on drawings.	___	___	X	___	X	___	___	___
c. TAB Report submitted.	___	___	X	___	X	___	___	___

Pre-commissioning Checklist - HVAC System Controls

For HVAC System: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. As-built shop drawings submitted.	___	___	X	X	___	___	___	___
b. Layout of control panel matches drawings.	___	___	X	X	___	___	___	___
c. Framed instructions mounted in or near control panel.	___	___	X	X	___	___	___	___
d. Components properly labeled (on inside and outside of panel).	___	___	X	X	___	___	___	___
e. Control components piped and/or wired to each labeled terminal strip.	___	___	X	X	___	___	___	___
f. EMCS connection made to each labeled terminal strip as shown.	___	___	X	X	___	___	___	___
g. Control wiring and tubing labeled at all terminations, splices, and junctions.	___	___	X	X	___	___	___	___
h. Shielded wiring used on electronic sensors.	___	___	X	X	___	___	___	___
i. Air dryer installed as specified.	___	___	X	X	___	___	___	___
j. Water drain installed as specified.	___	___	X	X	___	___	___	___
Main Power and Control Air								
a. 110 volt AC power available to panel.	___	___	___	X	___	___	___	___
b. 138 kPa gauge (20 psig) compressed air available to panel.	___	___	X	X	___	___	___	___
Testing, Commissioning, and Balancing								
a. Testing, Commissioning, and Balancing Report submitted.	___	___	X	___	___	___	___	___

Pre-commissioning Checklist - Single Zone Air Handling Unit

For Air Handling Unit: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Vibration isolation devices installed.	__	__	X	X	X	__	__	__
b. Inspection and access doors are operable and sealed.	__	__	X	__	X	__	__	__
c. Casing undamaged.	__	__	X	X	X	__	__	__
d. Insulation undamaged.	__	__	X	X	X	__	__	__
e. Condensate drainage is unobstructed.	__	__	X	X	X	__	__	__
f. Fan belt adjusted.	__	__	X	__	X	__	__	__
g. Any damage to coil fins has been repaired.	__	__	X	__	X	__	__	__
h. Manufacturer's required maintenance clearance provided.	__	__	X	X	X	__	__	__
Electrical								
a. Power available to unit disconnect.	__	__	__	X	X	__	__	__
b. Power available to unit control panel.	__	__	__	X	__	__	__	__
c. Proper motor rotation verified.	__	__	__	__	X	__	__	__
d. Verify that power disconnect is located within sight of the unit it controls.	__	__	__	X	__	__	__	__
e. Power available to electric heating coil.	__	__	__	X	__	__	__	__
Coils								
[a. Chilled water piping properly connected.	__	__	X	__	__	__	__	__]
[a. Refrigerant piping properly connected.	__	__	X	X	X	__	__	__]
[b. Chilled water piping pressure tested.	__	__	X	X	X	__	__	__]
[b. Refrigerant piping pressure tested.	__	__	X	X	X	__	__	__]
[c. Hot water piping properly connected.	__	__	X	__	__	__	__	__]
[c. Steam and condensate piping properly connected.	__	__	X	X	X	__	__	__]
[d. Hot water piping pressure tested.	__	__	X	X	__	__	__	__]
[d. Steam and condensate piping pressure tested.	__	__	X	X	X	__	__	__]

Pre-commissioning Checklist - Single Zone Air Handling Unit

For Air Handling Unit: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
[e. Air vents installed on water coils [with shutoff valves] as specified.	___	___	X	X	X	___	___	___
f. Any damage to coil fins has been repaired.	___	___	X	___	X	___	___	___
Controls								
a. Control valves/actuators properly installed.	___	___	X	___	___	___	___	___
b. Control valves/actuators operable.	___	___	X	___	___	___	___	___
c. Dampers/actuators properly installed.	___	___	X	___	___	___	___	___
d. Dampers/actuators operable.	___	___	X	___	___	___	___	___
e. Verify proper location and installation of thermostat.	___	___	X	___	___	___	___	___
Testing, Adjusting, and Balancing (TAB)								
a. Construction filters removed and replaced.	___	___	X	___	X	___	___	___
b. TAB results +10%/-0% L/s shown on drawings.	___	___	X	___	X	___	___	___
c. TAB Report submitted.	___	___	X	___	X	___	___	___

Pre-commissioning Checklist - Energy Recovery System

For Energy Recovery System: [_____]

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Recovery system piping installed.	___	___	X	___	X	___	___	___
b. Recovery system piping tested.	___	___	X	X	X	___	___	___
c. Air vent installed as specified.	___	___	X	X	X	___	___	___
d. Manufacturer's required maintenance clearance provided.	___	___	X	X	X	___	___	___
Startup								
a. Recovery system piping cleaned and filled.	___	___	X	X	X	___	___	___
b. Converter startup and checkout complete.	___	___	X	X	X	___	___	___
Controls								
a. Control valves/actuators properly installed.	___	___	X	___	___	___	___	___
b. Control valves/actuators operable.	___	___	X	___	___	___	___	___

APPENDIX B

FUNCTIONAL PERFORMANCE TESTS CHECKLISTS

Functional Performance Test Checklist - Pumps

For Pump: [_____]

Prior to performing this checklist, ensure that for closed loop systems, system is pressurized and the make-up water system is operational or, for open loop systems, that the sumps are filled to the proper level.

1. Activate pump start using control system commands (all possible combination, on/auto, etc.). ON_____ AUTO_____ OFF_____

a. Verify pressure drop across strainer:

Strainer inlet pressure _____ kPa (_____ psig)
Strainer outlet pressure _____ kPa (_____ psig)

b. Verify pump inlet/outlet pressure reading, compare to Testing, Adjusting, and Balancing (TAB) Report, pump design conditions, and pump manufacturer's performance.

	DESIGN	SYSTEM TEST	ACTUAL
Pump inlet pressure (kPa gauge)	_____	_____	_____
Pump outlet pressure (kPa gauge)	_____	_____	_____

c. Operate pump at shutoff and at 100 percent of designed flow when all components are in full flow. Plot test readings on pump curve and compare results against readings taken from flow measuring devices.

	SHUTOFF	100 percent
Pump inlet pressure (kPa gauge)	_____	_____
Pump outlet pressure	_____	_____
Pump flow rate (L/s)	_____	_____

d. Operate pump at shutoff and at minimum flow or when all components are in full by-pass. Plot test readings on pump curve and compare results against readings taken from flow measuring devices.

	SHUTOFF	100 percent
Pump inlet pressure (kPa gauge)	_____	_____
Pump outlet pressure	_____	_____
Pump flow rate (L/s)	_____	_____

2. Verify motor amperage each phase and voltage phase to phase and phase to ground for both the full flow and the minimum flow conditions.

a. Full flow:

	PHASE 1	PHASE 2	PHASE 3
Amperage	_____	_____	_____
Voltage	_____	_____	_____
Voltage	_____	_____	_____
Voltage to ground	_____	_____	_____

b. Minimum flow:

Functional Performance Test Checklist - Pumps

For Pump: [_____]

	PHASE 1	PHASE 2	PHASE 3
Amperage	_____	_____	_____
Voltage	_____	_____	_____
Voltage	_____	_____	_____
Voltage to ground	_____	_____	_____

3. Unusual vibration, noise, etc.

4. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative

Contractor's Mechanical Representative

Contractor's Electrical Representative

Contractor's Testing, Adjusting and Balancing Representative

Contractor's Controls Representative

Contracting Officer's Representative

Using Agency's Representative

Functional Performance Test Checklist - Centrifugal Chiller

For Chiller: [_____]

1. Functional Performance Test: Contractor shall demonstrate operation of chilled water system as per specifications including the following: Start building air handler to provide load for chiller. Activate controls system chiller start sequence as follows:

- a. Time of day startup program initiates chiller start: _____
- b. Start condenser water pump and establish condenser water flow. Verify chiller condenser water proof-of-flow switch operation. _____
- c. Start chilled water pump and establish chilled water flow. Verify chiller chilled water proof-of-flow switch operation. _____
- d. Verify control system energizes chiller start sequence. _____
- e. Verify chiller senses chilled water temperature above set point and control system activates chiller start. _____
- f. Verify functioning of "soft start" sequence. _____
- g. Shut off air handling equipment to remove load on chilled water system. Verify chiller shutdown sequence is initiated and accomplished after load is removed. _____
- h. Restart air handling equipment one minute after chiller shut down. Verify condenser water pump, cooling tower, and chiller restart sequence. _____

2. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative _____

Contractor's Mechanical Representative _____

Contractor's Electrical Representative _____

Contractor's Testing, Adjusting and Balancing Representative _____

Contractor's Controls Representative _____

Contracting Officer's Representative _____

Using Agency's Representative _____

Functional Performance Test Checklist - Cooling Tower

For Cooling Tower: [_____]

1. Functional Performance Test: Contractor shall demonstrate operation of the cooling tower as per specification and the following:

a. Activate cooling tower fan start using control system command. This should first start condenser water pump, establish flow, delay fan start, as specified, to equalize flow in distribution basin and sump. Verify fan start after timed delay. _____

b. After chiller startup, control system should modulate bypass valve and two-speed fan motor to maintain condenser water set point. Verify function of bypass valve under varying loads. _____

c. Verify cooling tower interlock with chiller. _____

d. Verify makeup water float valve is functioning: _____
Activate chemical treatment feed valve, verify makeup of chemical treatment system, pump, and controls: _____

e. Entering water temperature [_____] degrees C
Leaving water temperature: [_____] degrees C
Air volume measured: [_____] L/s
Air volume calculated: [_____] L/s
Entering wet bulb temperature: [_____] degrees C
Measured water flow: [_____] L/s

2. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative _____

Contractor's Mechanical Representative _____

Contractor's Electrical Representative _____

Contractor's Testing, Adjusting and Balancing Representative _____

Contractor's Controls Representative _____

Contracting Officer's Representative _____

Using Agency's Representative _____

Functional Performance Test Checklist - VAV Terminals

The Contracting officer will select VAV terminals to be spot-checked during the functional performance test. The number of terminals shall not exceed [2] [10] [10 percent].

1. Functional Performance Test: Contractor shall demonstrate operation of selected VAV boxes as per specifications including the following:

a. Cooling only VAV boxes:

(1) Verify VAV box response to room temperature set point adjustment. Turn thermostat to 5 degrees F above ambient and measure maximum air flow. Turn thermostat to 5 degrees F below ambient and measure minimum air flow.

Maximum flow [_____] L/s

Minimum flow [_____] L/s

(2) Check damper maximum/minimum flow settings.

Maximum flow setting [_____] L/s

Minimum flow setting [_____] L/s

b. Cooling with reheat VAV boxes:

(1) Verify VAV box response to room temperature set point adjustment. Turn thermostat to 3 degrees C above ambient and measure maximum air flow. Turn thermostat to 3 degrees C below ambient and measure minimum air flow.

Maximum flow [_____] L/s

Minimum flow [_____] L/s

(2) Check damper maximum/minimum flow settings.

Maximum flow setting [_____] L/s

Minimum flow setting [_____] L/s

Reheat coil operation range (full open to full closed) _____

c. Fan powered VAV boxes:

(1) Verify VAV box response to sensor call for heating via set point adjustment. Changes to be cooling setpoint to heating set point and return to cooling set point. _____ Verify cooling damper closes to minimum position, blower fan energizes according to sequence of operation, and upon further drop in space temperature, heating coil activation and deactivation. _____

(2) Check primary air damper maximum/minimum flow settings.

Maximum flow setting [_____] L/s

Minimum flow setting [_____] L/s

(3) Check blower fan flow. [_____] L/s

Functional Performance Test Checklist - VAV Terminals

(4) Verify free operation of fan backdraft damper (insure no primary air is being discharged through the recirculated air register).

(5) Verify that no recirculated air is being induced when box is in full cooling.

2. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative

Contractor's Mechanical Representative

Contractor's Electrical Representative

Contractor's Testing, Adjusting and Balancing Representative

Contractor's Controls Representative

Contracting Officer's Representative

Using Agency's Representative

Functional Performance Test Checklist - Variable Volume Air Handling Unit

For Air Handling Unit: [_____]

Ensure that a slight negative pressure exists on inboard side of the outside air dampers throughout the operation of the dampers. Modulate OA, RA, and EA dampers from fully open to fully closed positions.

1. Functional Performance Test: Contractor shall verify operation of air handling unit as per specification including the following:

a. The following shall be verified when the [supply fan operating] [supply and return fans operating] mode is initiated:

(1) All dampers in normal position [and fan inlet vanes modulate to maintain the required static pressure]. _____

(2) All valves in normal position. _____

(3) System safeties allow start if safety conditions are met. _____

(4) VAV fan controller shall "soft-start" fan. _____

(5) Modulate all VAV boxes to minimum air flow and verify that the static pressure does not exceed the design static pressure Class shown.

b. Occupied mode of operation - economizer de-energized.

(1) Outside air damper at minimum position. _____

(2) Return air damper open. _____

(3) Relief air damper [at minimum position] [closed]. _____

(4) Chilled water control valve modulating to maintain leaving air temperature set point. _____

(5) Fan VAV controller receiving signal from duct static pressure sensor and modulating fan to maintain supply duct static pressure set point.

c. Occupied mode of operation - economizer energized.

(1) Outside air damper modulated to maintain mixed air temperature set point. _____

(2) Relief air damper modulates with outside air damper according to sequence of operation. _____

(3) Chilled water control valve modulating to maintain leaving air temperature set point. _____

(4) Hot water control valve modulating to maintain leaving air temperature set point. _____

(5) Fan VAV controller receiving signal from duct static pressure sensor and modulating fan to maintain supply duct static pressure set point.

Functional Performance Test Checklist - Variable Volume Air Handling Unit

For Air Handling Unit: [_____]

d. Unoccupied mode of operation

(1) All dampers in normal position. _____

(2) Verify low limit space temperature is maintained as specified in sequence of operation. _____

e. The following shall be verified when the [supply fan off] [supply and return fans off] mode is initiated:

(1) All dampers in normal position. _____

(2) All valves in normal position. _____

(3) Fan de-energizes. _____

f. Verify the chilled water coil control valve operation by setting all VAV's to maximum and minimum cooling.

	Max cooling	Min cooling
Supply air volume (_____ L/s)	_____	_____
Supply air temp. (_____ degrees C)	_____	_____

g. Verify safety shut down initiated by smoke detectors. _____

h. Verify safety shut down initiated by low temperature protection thermostat. _____

2. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative _____

Contractor's Mechanical Representative _____

Contractor's Electrical Representative _____

Contractor's Testing, Adjusting and Balancing Representative _____

Contractor's Controls Representative _____

Contracting Officer's Representative _____

Using Agency's Representative _____

Functional Performance Test Checklist - Single Zone Air Handling Unit

For Air Handling Unit: [_____]

1. Functional Performance Test: Contractor shall verify operation of air handling unit as per specification including the following:

a. The following shall be verified when the [supply fan operating] [supply and return fans operating] mode is initiated:

(1) All dampers in normal position. _____

(2) All valves in normal position. _____

(3) System safeties allow start if safety conditions are met. _____

b. Occupied mode of operation - economizer de-energized.

(1) Outside air damper at minimum position. _____

(2) Return air damper open. _____

(3) Relief air damper [at minimum position] [closed]. _____

(4) Chilled water control valve modulating to maintain space cooling temperature set point. _____

(5) Hot water control valve modulating to maintain space heating temperature set point input from outside air temperature controller. _____

c. Occupied mode of operation - economizer energized.

(1) Outside air damper modulated to maintain mixed air temperature set point. _____

(2) Relief air damper modulates with outside air damper according to sequence of operation. _____

(3) Chilled water control valve modulating to maintain space cooling temperature set point. _____

d. Unoccupied mode of operation

(1) All dampers in normal position. _____

(2) Verify low limit space temperature is maintained as specified in sequence of operation. _____

e. The following shall be verified when the [supply fan off] [supply and return fans off] mode is initiated:

(1) All dampers in normal position. _____

(2) All valves in normal position. _____

(3) Fan de-energizes. _____

f. Verify cooling coil and heating coil operation by varying

Functional Performance Test Checklist - Single Zone Air Handling Unit

For Air Handling Unit: [_____]

thermostat set point from cooling set point to heating set point and
returning to cooling set point. _____

g. Verify safety shut down initiated by smoke detectors. _____

h. Verify safety shut down initiated by low temperature protection
thermostat. _____

2. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative _____

Contractor's Mechanical Representative _____

Contractor's Electrical Representative _____

Contractor's Testing, Adjusting and Balancing Representative _____

Contractor's Controls Representative _____

Contracting Officer's Representative _____

Using Agency's Representative _____

Functional Performance Test Checklist - Multizone Air Handling Unit

For Air Handling Unit: [_____]

Ensure that a slight negative pressure exists on inboard side of the outside air dampers throughout the operation of the dampers. Modulate OA, RA, and EA dampers from fully open to fully closed positions.

1. Functional Performance Test: Contractor shall verify operation of air handling unit as per specification including the following:

a. The following shall be verified when the supply and return fans operating mode is initiated:

(1) All dampers in normal position. _____

(2) All valves in normal position. _____

(3) System safeties allow start if safety conditions are met. _____

b. Occupied mode of operation - economizer de-energized.

(1) Outside air damper at minimum position. _____

(2) Return air damper open. _____

(3) Relief air damper [at minimum position] [closed]. _____

(4) Chilled water control valve modulating to maintain cold deck supply air temperature set point. _____

(5) Hot water control valve modulating to maintain hot deck supply air temperature set point input from outside air temperature controller.

c. Occupied mode of operation - economizer energized.

(1) Outside air damper modulates to maintain mixed air temperature set point. _____

(2) Relief air damper modulates with outside air damper according to sequence of operation. _____

(3) Chilled water control valve modulating to maintain cold deck supply air temperature set point. _____

(4) Hot water control valve modulating to maintain hot deck supply air temperature set point input from outside air temperature controller.

d. Unoccupied mode of operation

(1) All dampers in normal position. _____

(2) Verify low limit space temperature is maintained as specified in sequence of operation. _____

e. The following shall be verified when the supply and return fans off

Functional Performance Test Checklist - Multizone Air Handling Unit

For Air Handling Unit: [_____] mode is initiated:

(1) All dampers in normal position. _____

(2) All valves in normal position. _____

(3) Fan de-energizes. _____

f. Verify zone damper operation by varying zone thermostat set points from cooling set point to heating set point and returning to cooling set point. _____

g. Verify safety shut down initiated by smoke detectors. _____

h. Verify safety shut down initiated by low temperature protection thermostat. _____

i. Index room thermostats to full cooling then to full heating. Measure and record cold deck, hot deck, and supply air temperatures and determine damper leakage for a minimum of 2 zones.

Cold deck temperature _____ degrees C (_____ degrees F)

Hot deck temperature _____ degrees C (_____ degrees F)

Zone _____

Cooling temperature _____ degrees C (_____ degrees F)

Heating temperature _____ degrees C (_____ degrees F)

Damper leakage cooling _____ degrees C (_____ degrees F)

Damper leakage heating _____ degrees C (_____ degrees F)

Zone _____

Cooling temperature _____ degrees C (_____ degrees F)

Heating temperature _____ degrees C (_____ degrees F)

Damper leakage cooling _____ degrees C (_____ degrees F)

Damper leakage heating _____ degrees C (_____ degrees F)

2. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative

Contractor's Mechanical Representative

Contractor's Electrical Representative

Contractor's Testing, Adjusting and Balancing Representative

Functional Performance Test Checklist - Multizone Air Handling Unit

For Air Handling Unit: [_____]

Contractor's Controls Representative

Contracting Officer's Representative

Using Agency's Representative

Functional Performance Test Checklist - Packaged Air Cooled Chiller

For Chiller: [_____]

1. Functional Performance Test: Contractor shall demonstrate operation of chilled water system as per specifications including the following: Start building air handler to provide load for chiller. Activate controls system chiller start sequence as follows.

a. Start chilled water pump and establish chilled water flow. Verify chiller-chilled water proof-of-flow switch operation. _____

b. Verify control system energizes chiller start sequence. _____

c. Verify chiller senses chilled water temperature above set point and control system activates chiller start. _____

d. Verify functioning of "soft start" sequence. _____

e. Shut off air handling equipment to remove load on chilled water system. Verify chiller shutdown sequence is initiated and accomplished after load is removed. _____

f. Restart air handling equipment one minute after chiller shut down. Verify chiller restart sequence. _____

2. Verify chiller inlet/outlet pressure reading, compare to Testing, Adjusting, and Balancing (TAB) Report, chiller design conditions, and chiller manufacturer's performance data.

	DESIGN	SYSTEM TEST	ACTUAL
Chiller inlet pressure (kPa gauge)	_____	_____	_____

Chiller outlet pressure (kPa gauge)	_____	_____	_____
-------------------------------------	-------	-------	-------

3. Verify chiller amperage each phase and voltage phase-to-phase and phase-to-ground.

	PHASE 1	PHASE 2	PHASE 3
Amperage	_____	_____	_____
Voltage	_____	_____	_____
Voltage	_____	_____	_____
Voltage to ground	_____	_____	_____

4. Record the following information:

Ambient dry bulb temperature _____ degrees C
 Ambient wet bulb temperature _____ degrees C
 Entering chilled water temperature _____ degrees C
 Leaving chilled water temperature _____ degrees C

5. Unusual vibration, noise, etc.

Functional Performance Test Checklist - Packaged Air Cooled Chiller

For Chiller: [_____]

6. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative

Contractor's Mechanical Representative

Contractor's Electrical Representative

Contractor's Testing, Adjusting and Balancing Representative

Contractor's Controls Representative

Contracting Officer's Representative

Using Agency's Representative

Functional Performance Test Checklist - Air Cooled Condensing Unit

For Condensing Unit: [_____]

1. Functional Performance Test: Contractor shall demonstrate operation of refrigeration system as per specifications including the following: Start building air handler to provide load for condensing unit. Activate controls system start sequence as follows.

a. Start air handling unit. Verify control system energizes condensing unit start sequence. _____

b. Shut off air handling equipment to verify condensing unit de-energizes. _____

c. Restart air handling equipment one minute after condensing unit shut down. Verify condensing unit restart sequence. _____

2. Verify condensing unit amperage each phase and voltage phase to phase and phase to ground.

	PHASE 1	PHASE 2	PHASE 3
Amperage	_____	_____	_____
Voltage	_____	_____	_____
Voltage	_____	_____	_____
Voltage to ground	_____	_____	_____

3. Record the following information:

Ambient dry bulb temperature	_____	degrees C
Ambient wet bulb temperature	_____	degrees C
Suction pressure	_____	kPa gauge
Discharge pressure	_____	kPa gauge

4. Unusual vibration, noise, etc.

5. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative

Contractor's Mechanical Representative

Contractor's Electrical Representative Representative

Contractor's Testing, Adjusting and Balancing

Functional Performance Test Checklist - Air Cooled Condensing Unit

For Condensing Unit: [_____]

Contractor's Controls Representative

Contracting Officer's Representative

Using Agency's Representative

Functional Performance Test Checklist - Hot Water Boiler

For Boiler: [_____]

1. Functional Performance Test: Contractor shall demonstrate operation of hot water system as per specifications including the following: Start building heating equipment to provide load for boiler. Activate controls system boiler start sequence as follows.

a. Start hot water pump and establish hot water flow. Verify boiler hot water proof-of-flow switch operation. _____

b. Verify control system energizes boiler start sequence. _____

c. Verify boiler senses hot water temperature below set point and control system activates boiler start. _____

d. Shut off building heating equipment to remove load on hot water system. Verify boiler shutdown sequence is initiated and accomplished after load is removed. _____

2. Verify boiler inlet/outlet pressure reading, compare to Test and Balance (TAB) Report, boiler design conditions, and boiler manufacturer's performance data.

	DESIGN	SYSTEM TEST	ACTUAL
Boiler inlet pressure (kPa gauge)	_____	_____	_____
Boiler outlet pressure (kPa gauge)	_____	_____	_____
Boiler flow rate (L/s)	_____	_____	_____
Flue-gas temperature at boiler outlet		_____	_____
Percent carbon dioxide in flue-gas		_____	_____
Draft at boiler flue-gas exit		_____	_____
Draft or pressure in furnace		_____	_____
Stack emission pollutants concentration	_____	_____	_____
Fuel type	_____	_____	_____
Combustion efficiency	_____	_____	_____

3. Record the following information:

Ambient temperature	_____	degrees C
Entering hot water temperature	_____	degrees C
Leaving hot water temperature	_____	degrees C

4. Verify temperatures in item 3 are in accordance with the reset schedule. _____

5. Verify proper operation of boiler safeties. _____

6. Unusual vibration, noise, etc. _____

Functional Performance Test Checklist - Hot Water Boiler

For Boiler: [_____] _____

7. Visually check refractory for cracks or spalling and refractory and tubes for flame impingement. _____

8. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative _____

Contractor's Mechanical Representative _____

Contractor's Electrical Representative _____

Contractor's Testing, Adjusting and Balancing Representative _____

Contractor's Controls Representative _____

Contracting Officer's Representative _____

Using Agency's Representative _____

Functional Performance Test Checklist - Steam Boiler

For Boiler: [_____]

1. Functional Performance Test: Contractor shall demonstrate operation of steam heating system as per specifications including the following: Start building heating equipment to provide load for boiler. Activate controls system boiler start sequence as follows.

a. Start steam heating system. Verify control system energizes boiler start sequence. _____

b. Verify boiler senses steam pressure below set point and control system activates boiler start. _____

c. Shut off building heating equipment to remove load on steam heating system. Verify boiler shutdown sequence is initiated and accomplished after load is removed. _____

d. Verify that water level and makeup water system are operational. _____

2. Verify boiler inlet/outlet pressure reading, compare to boiler design conditions and manufacturer's performance data.

	DESIGN	SYSTEM TEST	ACTUAL
Boiler inlet water temp (degrees F)	_____	_____	_____
Boiler outlet pressure (kPa gauge)	_____	_____	_____
Flue-gas temperature at boiler outlet (degrees C)	_____	_____	_____
Percent carbon dioxide in flue-gas	_____	_____	_____
Draft at boiler flue-gas exit	_____	_____	_____
Draft or pressure in furnace	_____	_____	_____
Stack emission pollutants concentration	_____	_____	_____
Fuel type	_____	_____	_____
Combustion efficiency	_____	_____	_____

3. Record the following information:

Ambient temperature _____ degrees C
Ambient temperature _____

4. Verify proper operation of boiler safeties. _____

5. Unusual vibration, noise, etc. _____

6. Visually check refractory for cracks or spalling and refractory and tubes for flame impingement. _____

7. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Functional Performance Test Checklist - Steam Boiler

For Boiler: [_____]

Signature and Date

Contractor's Chief Quality Control Representative

Contractor's Mechanical Representative

Contractor's Electrical Representative

Contractor's Testing, Adjusting and Balancing Representative

Contractor's Controls Representative

Contracting Officer's Representative

Using Agency's Representative

Functional Performance Test Checklist - Fan Coil Units

The Contracting Officer will select fan coil units to be spot-checked during the functional performance test. The number of terminals shall not exceed [2] [10] [10 percent].

1. Functional Performance Test: Contractor shall demonstrate operation of selected fan coils as per specifications including the following:

a. Cooling only fan coils:

(1) Verify fan coil unit response to room temperature set point adjustment. Changes to be cooling set point to cooling set point minus 10 degrees and return to cooling set point. _____

(2) Check blower fan air flow. _____ L/s
Check blower fan air flow.

(3) Check cooling coil water flow. _____ L/s
Check cooling coil water flow.

(4) Verify proper operation of cooling water control valve. _____

b. Cooling/heating fan coils:

(1) Verify fan coil unit response to room temperature set point adjustment. Changes to be cooling set point to heating set point and return to cooling set point. _____

(2) Check blower fan air flow. _____ L/s
Check blower fan air flow.

(3) Check cooling coil water flow. _____ L/s
Check cooling coil water flow.

(4) Verify proper operation of cooling water control valve. _____

(5) Check cooling mode inlet air temperature. _____ degrees C
Check cooling mode inlet air temperature.

(6) Check cooling mode outlet air temperature. _____ degrees C
Check cooling mode outlet air temperature.

(7) Check heating coil water flow. _____ L/s
Check heating coil water flow.

(8) Verify proper operation of heating water control valve. _____

(9) Check heating mode inlet air temperature. _____ degrees C
Check heating mode inlet air temperature.

(10) Check heating mode outlet air temperature. _____ degrees C
Check heating mode outlet air temperature.

2. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Functional Performance Test Checklist - Fan Coil Units

Signature and Date

Contractor's Chief Quality Control Representative

Contractor's Mechanical Representative

Contractor's Electrical Representative

Contractor's Testing, Adjusting and Balancing Representative

Contractor's Controls Representative

Contracting Officer's Representative

Using Agency's Representative

Functional Performance Test Checklist - Unit Heaters

The Contracting Officer will select unit heaters to be spot-checked during the functional performance test. The number of terminals shall not exceed [2] [10] [10 percent].

1. Functional Performance Test: Contractor shall demonstrate operation of selected unit heaters as per specifications including the following:

a. Verify unit heater response to room temperature set point adjustment. Changes to be heating set point to heating set point minus 10 degrees and return to heating set point. _____

b. Check blower fan speed. _____ rpm

c. Check heating mode inlet air temperature. _____ degrees C Check heating mode inlet air temperature.

d. Check heating mode outlet air temperature. _____ degrees C Check heating mode outlet air temperature.

2. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative

Contractor's Mechanical Representative

Contractor's Electrical Representative

Contractor's Testing, Adjusting and Balancing Representative

Contractor's Controls Representative

Contracting Officer's Representative

Using Agency's Representative

Functional Performance Test Checklist - Steam/Hot Water Converter

For Converter: [_____]

1. Functional Performance Test: Contractor shall demonstrate operation of heating system as per specifications including the following: Start building heating equipment to provide load for converter.

- a. Verify control system energizes. _____
 - b. Verify converter senses hot water temperature below set point and control system modulates steam valve. _____
 - c. Shut off building heating equipment to remove load on heating system. Verify converter steam valve closes after load is removed. _____
2. Verify converter inlet/outlet pressure reading, compare to converter design conditions and manufacturer's performance data.

	DESIGN	ACTUAL
Converter inlet water temp (degrees C)	_____	_____
Converter outlet water temp (degrees F)	_____	_____
Converter inlet steam pressure (psig)	_____	_____
Determine water flow rate based on pressure drop through converter	_____	_____
Determine water flow rate with flow measuring device	_____	_____
Verify that temperature of water is in accordance with outdoor air reset schedule	_____	_____

- 3. Verify proper operation of converter safeties. _____
- 4. Check and report unusual vibration, noise, etc. _____

5. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative _____

Contractor's Mechanical Representative _____

Contractor's Electrical Representative _____

Contractor's Testing, Adjusting and Balancing Representative _____

Contractor's Controls Representative _____

Contracting Officer's Representative _____

Functional Performance Test Checklist - Steam/Hot Water Converter

For Converter: [_____]

Using Agency's Representative

Functional Performance Test Checklist - Computer Room Unit

For Computer Room Unit: [_____]

1. Functional Performance Test: Contractor shall verify operation of computer room unit as per specification including the following:

- a. System safeties allow start if safety conditions are met. _____
- b. Verify cooling and heating operation by varying thermostat set point from space set point to space set point plus 10 degrees, space set point minus 10 degrees, and returning to space set point. _____
- c. Verify humidifier operation by varying humidistat set point from space set point to space set point plus 20 percent RH, and returning to space set point. _____
- d. Verify that airflow is within +10/-0 percent of design airflow. _____
- e. Verify unit shut down during fire event initiated by smoke/heat sensors. _____

2. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative _____

Contractor's Mechanical Representative _____

Contractor's Electrical Representative _____

Contractor's Testing, Adjusting and Balancing Representative _____

Contractor's Controls Representative _____

Contracting Officer's Representative _____

Using Agency's Representative _____

Functional Performance Test Checklist - HVAC Controls

For HVAC System: [_____]

The Contracting Officer will select HVAC control systems to undergo functional performance testing. The number of systems shall not exceed [2] [10] [10 percent].

1. Functional Performance Test: Contractor shall verify operation of HVAC controls by performing the following tests:

a. Verify that controller is maintaining the set point by manually measuring the controlled variable with a thermometer, sling psychrometer, inclined manometer, etc.

b. Verify sensor/controller combination by manually measuring the controlled medium. Take readings from control panel display and compare readings taken manually. Record all readings.

Sensor _____
Manual measurement _____
Panel reading value _____

c. Verify system stability by changing the controller set point as follows:

- (1) Air temperature - 10 degrees F
- (2) Water temperature - 10 degrees F
- (3) Static pressure - 10 percent of set point
- (4) Relative humidity - percent (RH)

The control system shall be observed for 10 minutes after the change in set point. Instability or excessive hunting will be unacceptable.

d. Verify interlock with other HVAC controls.

e. Verify interlock with fire alarm control panel.

f. Verify interlock with EMCS.

[g. Change controller set point 10 percent with EMCS and verify correct response.]

2. Verify that operation of control system conforms to that specified in the sequence of operation.

3. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative _____

Contractor's Mechanical Representative _____

Functional Performance Test Checklist - HVAC Controls

For HVAC System: [_____]

Contractor's Electrical Representative _____

Contractor's Testing, Adjusting and Balancing Representative

Contractor's Controls Representative _____

Contractor's Officer's Representative _____

Using Agency's Representative _____

Functional Performance Test Checklist - Energy Recovery System

For Energy Recovery System: [_____]

1. Functional Performance Test: Contractor shall demonstrate operation of energy recovery system as per specifications including the following: Start equipment to provide energy source for recovery system.

- a. Verify energy source is providing recoverable energy. _____
- b. Verify recovery system senses available energy and activates. _____
- c. Verify that recovery system deactivates when recoverable energy is no longer available. _____

2. Verify recovery system inlet/outlet readings, compare to design conditions and manufacturer's performance data.

	Design	Actual
Primary loop inlet temp (degrees C)	_____	_____
Primary loop outlet temp (degrees F)	_____	_____
Primary loop flow rate	_____	_____
Secondary loop inlet temp (degrees)	_____	_____
Secondary loop outlet temp (degrees C)	_____	_____
Energy recovered (kJ)	_____	_____

3. Check and report unusual vibration, noise, etc.

4. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative _____

Contractor's Mechanical Representative _____

Contractor's Electrical Representative _____

Contractor's Testing , Adjusting and Balancing Representative _____

Contractor's Controls Representative _____

Contractor's Officer's Representative _____

Using Agency's Representative _____

-- End of Section --

ATTACHMENT H

EC 1110-1-94

CLASS OF TYPE OF CONSTRUCTION